SIXTH ANNUAL REPORT

61175

OF THE

BOARD OF HEALTH

OF THE

STATE OF NEW JERSEY.

1882.

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1882.

THE STATE BOARD OF HEALTH.

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REPORT OF THE SECRETARY OF THE BOARD.

To His Excellency, George C. Ludlow,

GOVERNOR:—In behalf of the State Board of Health of New Jersey, I beg leave to present to your Excellency the sixth report of the Board. In no previous year have the duties which have devolved upon it been so numerous, or its relations to the local and general interests of the State so responsible. This is because the public mind has become impressed with the fact that much of sickness arises from avoidable causes; because local Boards oftener have occasion to consult us as to the means of abating or preventing evils injurious to health and life, and because some laws passed by the last Legislature enlarged the field of our inquiry. Health administration on the part of the State is no longer looked upon as only a charity, or as one of the general ways which a government has of indicating its interest in its citizens. Neither is it a plan for meeting only the emergencies of a sudden epidemic. It takes the higher and well-sustained view that race vitality, physical vigor and the avoidance of the ascertained causes or concomitants of disease, are essential to the welfare of the people and to the prosperity of the body politic. It sees that a State, in its organic capacity, cannot ignore so indispensable a condition to its development and progress. Our social and national status is determined not less by the vigor of the body than by the education of the mind. Indeed, education which does not give large attention to bodily health is itself defective. Political economy no longer closes its eyes to the significance of inquiries into the health of the population, as bearing upon all questions of industry, finance and thrift. The health of the laborer is not only an element in "the production of wealth, but in the permanency of the State." The health of the family defines the capacity of wages to confer comfort and self-support, more than does the numerical statement of dollars and cents. Not less does it concern *all* citizens and all families in a common defence and a mutual interest to see to it that no oppressive tax is

levied by the burdens of avoidable disease. If so, palsied industries, depressed spirits and inadequate means conjoin to degrade the people, and life, liberty and happiness are alike imperiled. As a practical infusion of energy and power into the people, no plan would be so successful as that which would reduce to a minimum the occurrence of ill-health and disease. The power that a State has thus to appreciate and in fact determine the physical vigor of its population, is no longer questioned, and the importance of giving large attention to its securement is too often painfully manifest. Mr. Spencer, in his recent visit to this country, in a criticism as kind as it is discerning, says: "In every circle I have met men who had themselves suffered from nervous collapse due to stress of business, or named friends who had either killed themselves by overwork, or had been permanently incapacitated, or had wasted long periods in endeavors to recover health. I do but echo the opinion of all the observant persons I have spoken to that immense injury is being done by this high-pressure life—the physique is being undermined. That subtle thinker and poet whom you have lately had to mourn, Emerson, says, in his essay on the gentleman, that the first requisite is that he shall be a good animal. The requisite is a general one—it extends to the man, to the father, to the citizen. We hear a great deal about 'the vile body,' and many are encouraged by the phrase to transgress the laws of health. But nature quietly suppresses those who treat thus disrespectfully one of her highest products, and leaves the world to be peopled by the descendants of those who are not so foolish.

"Beyond these immediate mischiefs there are remoter mischiefs. * * * * Also, there is injury to the posterity. Damaged constitutions re-appear in children and entail on them far more of ill than great fortunes yield them of good. When life has been duly rationalized by science it will be seen that among a man's duties care of the body is imperative, not only out of regard for personal welfare, but also out of regard for descendants. His constitution will be considered as an entailed estate, which he ought to pass on uninjured if not improved to those who follow; and it will be held that millions bequeathed by him will not compensate for feeble health and decreased ability to enjoy life."

To this Board has been assigned the duty of taking "cognizance of the interests of health and life among the citizens of this State; of making sanitary investigations and inquiries in respect to the people, the cause of disease and especially of epidemics, and the sources of

mortality and the effects of localities, employments, conditions and circumstances on the public health." Such inquiries not only call for a general superintendence over the more vital concerns of population, but lead us to co-operate with local Boards and governing authorities in all that relates to information and advisement for the public health. Besides the broad field of inquiry which the constituting act suggests, the Legislature has, from time to time, specified the direction and method of special investigations, and so has not left us in doubt both as to the extent and significance of the work.

The year just closed gives us the general fact as to the vital movements of the population, that there have been 8837 marriages, 23,108 births, 25,942 deaths. The report of the Bureau of Vital Statistics more fully states and analyzes the significance of these figures. It may well be noticed here, however, that for the statistical year which ended July 1st, 1882, there was an increase of 5130 over the previous year. Some of the increase was directly owing to the exceptional winters and summers of the years 1879–80 and 1880–81. But when we take the low death rate of choice localities in the State and compare with it the losses in some cities, and then, again, in the excessive infant mortality trace the unfriendly influences which kill the younger population, and depress and shorten older lives, it is easy to see that much of this might be avoided. The occurrence of malaria and of two or three typhoid endemics, will be noted in another connection. Local outbursts of diphtheria have occurred at New Hampton, New Brunswick, Bridgeton, Dover, Newark and Phillipsburg, and to a less degree in a few other localities. Measles has been largely epidemic in the State, but not in a fatal form. The tables of death rate show a somewhat diffused prevalence of scarlet fever.

Small-pox, as noticed in the last report, affected many localities in the State. The efficiency of local Health Boards and the more intelligent views of early isolation and vaccination, alone prevented it from becoming a general epidemic. With an early infection of Camden and Hoboken and several foci of the disease started in the State, it was only the vigilance of local authorities that confined it within limits. We have had from various points most satisfactory evidence of the value of this attention, and have been able to help local Boards in rapidly perfecting methods of quarantine and protection. The experience of Paterson was more unfortunate, and was complicated by the distribution of some useless vaccine lymph. Yet here a severe epidemic was checked by giving additional powers to health officers.

Much has been learned as to methods of guarding against imperfect vaccine lymph. Papers which form a part of this report, give valuable information to the people as well as to physicians, on this subject. Fuller details as to other diseases will be found in the report of the Medical Superintendent of State Vital Statistics.

WATER-SUPPLY.

The securement of a healthy water-supply for the citizens of this State is so obvious a necessity that we only have reason to point out the risks of its pollution, and the sources from which a supply is to be derived. In order for this the water-sheds of the State and its natural drainage need to be carefully considered. The pollution of wells in crowded cities is almost inevitable, and hence the chief reliance has to be placed on a general water-supply. Driven wells have been used in some parts of the State to advantage. These are often found to be impregnated with mineral matter, so as to be unpalatable, and even organic matter, through sandy soil, reaches them far deeper than would be supposed. Cisterns properly constructed and under careful supervision, provide for many places where well-water, or a public supply, is not available. About thirty of our cities already have water-works. Somerville and Orange have introduced water the past year, and Princeton, Asbury Park, Atlantic City, Gloucester City and other towns are busy in the planning or execution of methods. There is need of the wisest forethought in providing for present and prospective population, and especially in reference to that area included within thirty miles of New York city, which alone contains one-half of the population of the whole State. Your Excellency, it will be remembered, drew the attention of the Legislature of 1882 to the subject in your first annual message, as follows:

"The two largest cities of the State, and much of the thickly-settled surrounding country, derive their supply of water from a stream defiled by the emptyings of manufactories and sewers for miles above the point at which it is drawn. This condition of affairs must continue to grow worse, since the natural growth of the communities increases alike the demand for pure water and the contamination of that upon which they depend. Fortunately, the evil is not irremediable. The natural channels of the Passaic river bring to within fifteen (15) miles of Jersey City, and a shorter distance from Newark, each day over four hundred million (400,000,000) gallons of pure

water, gathered from streams, springs and lakes of a mountainous and thinly-settled district of country. This immense quantity is delivered in a pure condition at a point one hundred and fifty (150) feet above the level of the sea, from which an easy descent can be made to the places where it is to be distributed. There is urgent necessity that this should be utilized for the benefit of the three hundred thousand (300,000) people who need it, especially as it is, at all times, liable to be pre-occupied by mills or taken by some single municipality, or, possibly, bought to satisfy the pressing want of the neighboring metropolis. The importance of this subject cannot well be over-estimated, since it includes within itself the health and prosperity of the most densely-populated and thriving portion of our State."

J. Bailey Denton, in his work on "Sanitary Engineering," p. 37, says:

"In mountainous and hilly districts, where sufficient areas of impervious gathering grounds can be found is the best means of supply, because it is of a character over which the engineer has most command. * * * I refer to the storage of rain-water therein off uncultivated surfaces, and collected before it becomes contaminated by foreign matter."

The Legislature, in the protection of this interest, passed "An act to provide for the appointment of commissioners to determine upon plans for the storage of any of the waters of this State for the purpose of furnishing to cities and towns a joint water-supply." (Ch. 189, Laws of 1882.)

Under this act Ashbel Welch, C. E., of Lambertville; Henry L. Butler, of Paterson; George Randall, of Newark; and Andrew Clerk, of Jersey City, were appointed commissioners. The sickness and lamented death of the distinguished chairman of the commission have delayed action. The commission will, no doubt, give thorough attention to the important work committed to its investigation.

Camden and other cities in the south and west of the State, also need carefully to guard their sources of supply. Because of the changes that are constantly taking place in the head-waters of streams or the various pollutions to which they may be subjected, there is constant need of supervision by the Water Boards in charge.

DRAINAGE.

"Drainage for Health," is one of the subjects, the importance of which needs to be most earnestly impressed.

"Perhaps," says Engineer Denton, "the most fruitful source of impurity of air in dwellings, is the damp condition of the ground immediately beneath and adjacent to them, which often becomes saturated with liquid filth by the too frequent practice of throwing the slops of the dwelling on the surface of yards or gardens, or by heaping upon it solid refuse of all sorts, to be washed into the soil by the rainfall, and to give off effluvia from their accumulated heaps, or to spread their minute particles in the air and be taken into the lungs by respiration. Soil, where drained or aërated, has an (p. 13) almost immeasurable power of cleansing any liquid that may enter and pass through it." But it is because in cities the ground is so often soaked with water as to furnish it stagnant water in place of circulating water and circulating air, that it becomes filth-sodden. Having no crop to consume the organic materials, it gives off its gases to the air to be inbreathed by persons. Such soil is also kept so wet as to reduce its temperature, while, by evaporation, greater cold is produced upon its surface. Such ground is always subject to such variations as are most unfriendly to health. Hence, "drainage has the effect of improving the temperature of the air incumbent upon the ground, as well as of raising that of the soil beneath."

After illustrating, by many facts, the effect of insufficient drainage on health, he says:

"The maintenance of pure air by the under-drainage of the soil surrounding or beneath dwellings, is an object only inferior in importance to the removal of putrescible matters. That this object is one of the most important that can engage the attention of the sanitary engineer cannot be denied, when it is shown, upon the authority of Dr. De Chaumont, that long-continued exposure to bad air tends to the production of scrofula and consumption—of which latter disease it is probably the most efficient cause. That it promotes enteric fevers; that it fosters ailments of the respiratory organs, such as catarrh, bronchitis and pneumonia; that it is frequently the cause of inflammation of the eyes, and that it adds to spread of the small-pox, measles, scarlet fever and the like, while it renders the rapid cure of wounds and sores of all kinds a work of great difficulty, is well known."

When it is remembered that water-courses or nature's natural drain-

age areas are constantly being disturbed by obstructions such as mill-dams, or by excavations and embankments, we are to see to it that some compensations are made for these. In cities, especially where ground is sealed by buildings, and an amount of water added to the soil which doubles the usual rain-fall, we are not to be surprised if there is an increase of most forms of disease and a lowering of the general vitality. It is not by a figure of speech that cities thus become "the graves of mankind." Science would prove what must be, even if experience had not proven it beforehand. In these modern days, with great increase of activities and with more ready means for rapidly distributing air and earth and water, we must inevitably have an increase of disease, unless some of our abilities at construction are applied in the direction of preservation and of compensation for evils which are otherwise destructive. Hence, a low level of ground-water is desirable for all cities, and only such access of storm-water and household-water supply as does not seriously or permanently raise the ground level. The facilities for drainage and the modes of its accomplishment are now well understood, so that the advantages thereof can be applied to the prevention or relief of much of the sickness that now occurs from over-damp building sites. In the same city there is often a great contrast as to strata and the average height of ground-water. Statistics, such as those of Pettenkofer as to Munich, of Dr. Snow as to London, and of Dr. Knight as to the Rochester and Medway districts, seem conclusively to show how mortality is increased by a wet subsoil.

MALARIA.

What to do to prevent malaria and malarial disease is not likely to cease to be a subject of earnest inquiry for long years to come. The fact that the evil has extended to parts of New England, where it had not before existed, and that in New York State and this State some places are affected which had long boasted of exemption, shows that there is at least no decrease in extent. New Jersey is not more exposed to the circumstances which occasion it than some other States, but we have especial need to study and guard against it, because where it does not cause death or find record in intense sickness, it does depress vital force, interfere with labor, become chronic in its effects and give a type to many fatal diseases. All the more because the agencies in its production are multiplied by the activities of such a State as this.

The removal of forests, the changing of water-courses, the excavations for railroads and various public improvements, the rapid building of cities and the mining of ore, clay, marl, etc., all tend to provide the best conditions for the malady. So far from diminution, we are only to expect its more rapid increase or more frequent recurring epidemics thereof unless we avail ourselves of methods of restriction. Dr. Snow, of Rhode Island, has so well stated its incursion into parts of that State, and illustrated so well the points at issue in dealing with it, that we quote from a letter of his to the Common Council of Providence, May, 1882:

"For a better understanding of the subject, it may be well to refer briefly to the cause or causes of fever and ague. In this vicinity, where we have never been familiar with the disease, there is much uncertainty and difference of opinion among the people in relation to its causes, and the most absurd theories are given upon the subject. In the locality referred to, we have been told that cases of the disease were caused by the water in Mashapaug Pond, other cases by heaps of animal matter, others by offensive sink drains, &c.

"In places where fever and ague has been a long time prevalent there is no such difference of opinion in regard to its causes. The real cause is well known. It may be stated briefly to be a poison in the atmosphere, commonly called '*malaria*,' which is generated in and arises from swamps and swampy places. Water alone, in ponds or running streams, can never cause fever and ague, dry earth can never cause it, decaying vegetable matter alone can never cause it; but it is produced by the combination of water, earth and decaying vegetable matter in the conditions usually found in swamps and so-called swampy places. It may be stated as a general truth, that so far as is known, fever and ague has never been produced except by swamps or swampy places.

"It is true that all swamps do not produce fever and ague, and none of the swamps in Rhode Island have produced it, within the memory of the oldest inhabitants, until within the last two or three years. Within that time a new element has come into the swamps of Rhode Island which did not exist there before, and which, existing in the swamps, produces the malaria of fever and ague. What this new element is, whether vegetable, animal, or something else, no one knows. We know that it has been gradually traveling from the vicinity of New York city, up the rivers and valleys of New England, during the last ten or fifteen years. We know that whenever it has reached a swamp, or swampy region, it has remained permanently, and has given rise to fever and ague, from year to year. But the fact still remains true, and this fact is important to be remembered, that fever and ague is never produced except by swamps and swampy places, and if the swamps are removed the disease is effectually prevented. Let us now return to the district about Mashapaug Pond, where the fever and ague has been prevalent during the last two years. * * *

"There is a considerable number of ponds and low swampy places in the malarial district referred to that are not marked on the city maps. The height of the water in all of these ponds and swamps, as well as in the ground throughout the malarial district, *is governed entirely by the height of the water in Mashapaug Pond*. At the present time, the water in Mashapaug Pond is three and a half to four feet above its natural level. The results of this are as follows:

"1. There are many acres of swamp on the borders of Spectacle Pond and on the brook leading from Spectacle to Mashapaug Pond, that are made swampy wholly by the extra height of the water in Mashapaug Pond. All these acres of swamp would be dry ground if Mashapaug Pond was kept at its natural level.

"2. The high water in Mashapaug Pond keeps all the numerous swampy places and hollows in that district in a swampy condition, so that all the dangerous effects of swamps are produced by them.

"3. The high water in Mashapaug Pond keeps the ground water in the whole district so high that many hollows are more or less wet, and many cellars are damp and unhealthy.

"4. In the swamps made by this high water the vegetable growth is luxuriant, and as the water falls in the late summer and autumn this vegetation dies and produces the conditions most favorable for the production of fever and ague.

"The conclusion from the preceding seems to be unavoidable—

"That the high water in Mashapaug Pond in the spring and early summer, making much swamp and swampy land with rank vegetation, and the fall of the water in the late summer and autumn producing decay of vegetation, are the principal, if not the sole cause, of prevalence of fever and ague in that vicinity.

"The important question is, What can be done to prevent the disease? Generally and everywhere, the disease can be prevented by the destruction of the swamps, and in no other way."

The cases referred to not only illustrate the correct views as to the combination of influences at work to produce remittent fever, intermittent fever, chills and fever, periodic neuralgia, and an interfering type of periodicity in other diseases, but also shows how a condition of high water in a lake, which would seem effective for the prevention of malaria, causes it to abound in adjacent grounds.

If there is any one point established in medical experience it is the relation of water, earth and decaying vegetable matter, acted upon by heat, to the occurrence of malaria. This does not assert that in every instance the coincidence or co-existence of these will produce malaria, any more than it is asserted that certain conditions of heat and filth will always give rise to cholera, scarlet fever, typhoid fever, etc. Sometimes a swamp or pond, filled with vegetable matter, seems to catch the malaria, and ever after to be able to reproduce and furnish it, and then our only remedy is to get clear of the pond. In other cases, all the factors of the disease seem to have met in just the proportions to produce the disease, and then we have it arising *de novo* or spontaneously, and ever after it is found endemic there unless the original cause is removed.

It is no harder to account for the coming of malaria to a certain locality, where it had not been before, than it is to account for the arrival of potato bugs to a section they never had invaded before. A

disease, like a plant or animal, locates where it finds food adapted to it. Unlike a plant or animal, it sometimes originates perhaps by chemical, perhaps by germinal forces from a place adapted also to its nourishment. When, as in very many diseases, we cannot detect the particle that infuses the disease into a human system, we may, nevertheless, detect the surroundings or influences which tend to foster the infection, as also the laws of its selection, both as to places and individuals, and the preventions or limitations which we may institute. While not ceasing to look for the germinal cause, or to feel the radical advantage of finding it, practically we do very much to vacate the disease if we can remove the surroundings which produce, nurture or multiply it, or define what persons it is most liable to attack, or how its attacks shall be prevented. On all these points we know far more than we are permitted to execute. For instance, the preservation or restoration of natural water-courses, or the providing of drainage where there is need of additional drying, the thorough cropping of the soil and limitation of vegetable decay, will do much to limit or prevent the disease. And as to persons, the avoidance of exposure to damp and night air, the sleeping in upper apartments, regular living, and, in some cases, the use of prophylactics and especial care until a kind of acclimatization has been attained, have practically much to do with the prevention of malarial diseases.

Also, we regret to say that we are too often multiplying its causes, when, for instance, a house, a village or a city is found without any previous deep drainage system. By the houses we build, and various other changes, we are interfering with evaporation and dampening the ground. Rain-water and refuse matter no longer yield themselves to a crop vegetation and sun-heat increases. Thus, unless additional drainage is instituted there is new water soaking, and there is fertilizing without cropping, and all the conditions either for producing or inviting the locality of malaria. Hence, each city tends to make of itself a centre of malaria, and even when partially caring for itself by avoiding vegetable decomposition, is apt to load its suburbs with all the materials of a malaria manufactory. Added to all, the natural drainage is very often interfered with. Our nearest way out of this trouble is to avail ourselves of our excellent State provisions for drainage, and to commit all our cities and townships to the care of such local Boards as will appreciate the cause of disease, and aid in giving correctness to public opinion until a sufficient number will

appreciate the necessity and authorize the work. It is fortunate that the advantage to property is as real as that to the general health.

CITY SEWERS.

Whatever may be the theories of individuals as to various modes of delivery of sewage, the fact must be admitted that the weight of authority inclines more and more to the approval of sewers as the appliance for the riddance of water-closet material and the general liquid refuse of households, factories, etc. It is no longer a question that these can be constructed so as to secure air and water-flushing, and be so connected with houses as to prevent evils from sewer gas and furnish safe conduits for the delivery of house liquid refuse. Great advance has been made in the last few years, in our knowledge of how to construct sewers properly and economically; how to secure proper flushing and ventilation; how, by traps and ventilators, to prevent the passage of air therefrom to houses, and thus how to make of them safe conduits for the prompt delivery of material which has no place within city limits. Objections made apply to avoidable imperfections or to neglects in administration rather than to inherent and unavoidable defects. While dry systems or cart delivery may serve in special cases and for smaller towns and villages, these generally fail, as applied to close populations. The question whether sewers shall be made to carry storm-water as well as house liquids, or whether land drainage shall be in any way combined, are questions to be decided by locality and circumstances; also, the question whether the outflow shall be into a river or into the ocean, or for surface or subsoil irrigation and fertilization of farms, or over a filter-bed previous to a river-flow—all these are subsidiary and collateral questions, to be decided on their merits for the locality. The one fact that city filth should not have city storage or be allowed to find its way into the soil, the water or the air of a city, is so important and undeniable that no city should satisfy itself with neglect or with half methods. The language and illustrations of Capt. Douglas Galton, in his recent address at the Fifth Congress of the Sanitary Institute of Great Britain, are worthy of note, as emphasizing the importance to be attached to the method of sewage and carriage. He says:

"There is no doubt that in the sewering of towns, want of experience in the construction of the works has, in some cases, led to deposits in the sewers, and to their failure to remove these dangerous gases, and that evil consequences have ensued;

but it may be accepted as certain that in every case where the sewerage has been devised on sound principles, and where the works have been carried on under intelligent supervision, a largely reduced death-rate has invariably followed. The records of New Castle afford evidence of this fact. The quinquennial period, beginning in 1868, showed a death-rate of 27.6; the quinquennial period ending in 1881, showed a death-rate of 23, whilst the death rate of 1881 was only 21.7.

"At the recent Sanitary Congress at Vienna, some remarkable results of the effects of the sewerage of certain German towns were given, which are very striking. Munich is the residence of one of the ablest sanitarians of Europe, viz., Dr. Pettenkofer. His admirable illustrations of the effect of the impurities which were accumulated in porous cesspits, upon the air of the town and the death-rate of the population, form a text-book of sanitary knowledge. At Munich the enteric fever mortality per 1,000,000 of inhabitants for quinquennial periods, was as under.

1854 to 1859, when there were absolutely no regulations for keeping the soil clean	24.2
1860 to 1865, when reforms were begun by cementing the sides and bottoms of the porous cesspits	16.8
1866 to 1873, when there was partial sewerage	13.3
1876 to 1880, when the sewerage was complete	8.7

"Similarly, at Frankfort-on-the-Main, the deaths from enteric fever per 10,000 were:

1854 to 1859, when there was no sewerage	8.7
1875 to 1880, when the sewerage was complete	2.4

"At Dantzig, the figures present some more striking characteristics; the deaths from enteric fever per 100,000 living, were as follows:

1865 to 1869, when there was no sewerage and no proper water-supply	108.
1871 to 1875, after the introduction of water-supply	90.
1876 to 1880, after the introduction of sewerage	18.

"Hamburg has been drained by Mr. Lindley, and he has stated that in his plans he carefully followed the principles laid down by Mr. Chadwick. In that town, the deaths from enteric fever per 1000 of total deaths, were:

From 1838 to 1844, before the commencement of the construction of any sewerage works	48.5
From 1871 to 1880, after the completion of the sewerage works,	13.3

"During the time that the works were in progress, viz., from 1872 to 1874, the mortality from enteric fever per 10,000 living, was:

In the unsewered districts	40.0
In the districts for the most part sewered	32 0
And in the fully sewered districts	26.8

"These results illustrate the effect of purifying the air of towns by the rapid abstraction of refuse matter, so as to prevent it from remaining and putrefying in and upon the ground."

Dr. J. W. Tripe, another eminent authority, thus speaks of the relations of soil, air and organic matter:

"As all the interstices of the ground are filled with air, the more porous the soil the greater is the quantity of contained air. The quantity is sometimes greatly in excess of what is commonly believed, as Professor Hartley states that it has been shown that the bulk of a gravelly soil consists of about one third air, whilst Pettenkofer says that it varies ordinarily between 3 and 10 per cent., and occupies the space between the stones and the particles of sand. If a cesspool or leaky drain-pipes are placed in this kind of soil, offensive emanations will be given off. These may, especially under variations of temperature and pressure of the air, travel a rather considerable distance, and make their way into houses, especially when the air of a house is raised by fires to a much higher temperature than that of the ground. Dr. Fyffe mentioned an instance where the foul air of a cesspool was drawn a distance of 27 feet into a house. Ground-air must also escape from the soil more quickly when the atmosphere is much warmer than the soil, or when a considerable diminution of barometric pressure suddenly occurs. It is, therefore, important that houses built upon gravel, and especially on made ground, should have the whole of the surface inside the walls covered with six inches of concrete, to prevent the entrance of ground-air. Ground-air consists chiefly of atmospheric air intermixed with carbonic acid, marsh gas, and occasionally sulphuretted hydrogen. If there be any putrefying organic matter in the soil, the ground-air will also be contaminated with injurious gases resembling sewer emanations.

"The ground-air is also displaced by rain, which raises the level of the ground-water, and also causes a rapid escape of air from the interstices of the soil. Winds, by their drying action on the surface of the soil, also assist in producing movements in the ground-air and in the level of ground-water Fevers, cholera, diarrhœa and dysentery are said to be caused by the escape of ground-air into houses."

DISPOSAL OF SEWAGE, ETC.

The care of all the liquid and solid refuse incident to household life, to city nearness of habitation, and to the various trades, factories and industries that necessarily aggregate in close relationship, is and must continue to be one of the most essential requisites to the preservation of health and life. No one is now found so bold as to dispute the causal relations of accumulated filth to some diseases and to general devitalized conditions. While many perplexing and undecided questions may arise, the common consent of observers founded on experience is, that the offalings incident to life must be removed or disposed of in such a way as not to poison the air we breathe, the food we eat, the water we drink, or the surroundings with which we are necessarily brought in contact. If all such material could be for a limited time prevented from any change and stored in the soil ready for the use of vegetable life, or if it could be submitted to ready oxidation or other such chemical or mechanical changes as would render it innocuous, it would certainly be best at once to fulfill these indications. It is not because the ideas of preservation, of utilization, etc., have not been entertained

or experimented upon that they have so rarely been adopted in large cities. It is because there has been found a practical limit to such plausible and reasonable suggestions, either by reason of expensiveness or insuperable difficulties of administration. This does not mean that plans of utilization, or chemical processes of precipitation, or dry removal, or separation or some other methods may not still be operated in certain localities, but it does mean, as a historical fact, that under the most careful advisement and with large experiences of different methods, some plan of removal by means of a sewer system has been constantly gaining in approval for cities of fifty thousand inhabitants or over. The history of the present system of Berlin and the caution with which it was entered upon after trials or consideration of various plans, is but an illustration of an experience that is becoming more and more uniform. Happily there has been a great increase of knowledge both as to the most efficient and least expensive plans. A city that has occasion to consider the question of sewage disposal, should always commit the determination of methods to skilled sanitarians and engineers. The municipal authorities while judging of capacity for expenditure and of the business methods of procedure, must come to feel the choice of method is as foreign to their judgment as would be the construction of a suspension bridge. So long as corporations or individuals sit in judgment on methods and engineering details, instead of submitting said points only to the judgment of their chosen advisers, we shall have plans which lack unity and fitness both in organization and execution. Reference to our former reports will furnish many suggestions to guide in those places where no sewer system has been adopted.

A paper accompanies this report that suggests a method of preventing cesspools from filling up so rapidly. It is a modification of the usual plan of grease trap, by which the grease is retained and the liquid slops and filth are enabled to find more ready access to the ground. Where the usual water level of a city is fifteen to twenty feet below its buildings, cesspools may be available, but in all other cases, they keep the filth too near the subsoil and the people.

OFFENSIVE TRADES AND MANUFACTORIES.

This Board has heretofore drawn the attention of local Boards of Health to the importance of guarding against those nuisances which now so often arise, either from dense smoke or from trades and factories which emit odors in a high degree offensive. Reference may well

be had to page 28 of the first report, and page 13 of the third report. From year to year there is an increasing tendency to locate such establishments in this State, in many cases because New York and Philadelphia authorities will not allow them within city limits. Many of these industries are desirable from a business standpoint, if only they are not allowed to become nuisances. For most of these vapors there are now well-known methods of consumption and of exclusion from the common air. Smoke-consuming apparatus is now so perfect that sanitary authority has recently said that there is no excuse for smoke nuisance. The real difficulty is that most of the apparatus and its care add to the expense. Also the stoker or other person in charge needs to be very vigilant as to his methods and thorough in their use. Such a book as that of Dr. Ballard, of the local Government Board of Great Britain, "As to effluvium nuisances arising in connection with various manufacturing and other branches of industry," as contained in the sixth, seventh and eighth annual reports (1876, Appendix 6, 1877 and 1878,) shows how thoroughly the difficulties have been recognized and met. Over and over again has the question been settled in England and in some of the large cities of this country, that such nuisances are infringements upon personal rights at common law, and must not be tolerated. Many of them are proven to be deleterious to health, but if they were not, if they disturb to a large degree the comfort of the average community, the principle and necessity of the abatement is obvious. It is not enough that the workmen are not destroyed thereby, or that they have acquired toleration of the offensive odors. It is the right of the citizen not to be subjected to such annoyances, when in kind and degree they permanently disturb the comfort of those resident in the vicinity. First of all, Boards of Health should be vigilant in notifying those proposing to start such manufactories or to introduce offensive trades, that they will be held to strict accordance with these views. When complaints are made there should be promptness in attending to them. Generally, the function of a local Board, is not in applying to them the police law of nuisances, such as is necessary in some sudden evil needing very rapid suspension, but to proceed or to unite with others in procuring such injunction or such indictment before grand juries, as shall restrain or abate the nuisance. The common law of this State has usually taken strong position as to this necessity, and not only have injunctions been granted, but as in the Elizabeth nuisance the Chancellor has ordered a special commission of experts with full and speedy powers of jurisdiction and abate-

Those who thus proceed will find no greater embarrassments than those which attend most forms of litigation, and will be able to prevent or remove many of the evils which in parts of this State have become most obtrusive and offensive.

STATE SANITARY SURVEY AND OBSERVATION.

It is well recognized among sanitarians that the material and layers and adjustments of the earth's surface, its relations to water and soil, its topography and locality, have much to do with the health of those living upon its surface. In addition, they often in certain conditions of health, afford the most intelligent indications for change. In order to promote this kind of observation and the recording of their experience by those best adapted for the purpose, this Board early in the year secured copies of the geological map of New Jersey for 1881, to be used by chosen observers in the study of these conditions. The results of such observations can only be had after a considerable time. The earlier work will be imperfect because it is so difficult to secure close record and analysis. Yet it cannot but be without excellent effect upon the local care of the population, and aid much in directing attention to local causes that appreciate or deteriorate the health of the inhabitants. The effect will be greatly aided by the topographical map of the State, a part of which is already completed. While the geologist and the engineer collect the data and so make them available, it is for us to study these for the welfare of animal life. Questions of drainage, of water-supply, and of weather are intimately associated with telluric or earth conditions. Not less intimately do lung and other diseases depend upon these. By careful study and observation we are thus able to acquaint ourselves with local exposures, and more fitly and pliably to adapt human life and its surroundings to each other.

LOCAL HEALTH BOARDS AND THEIR DUTIES.

The Health Boards of the State vary in efficiency according to the intelligence of the people of the respective districts as to health matters, and the powers conferred upon the Board, and the capacity and tact of the officers who compose them. In the few districts where there is little progress and where the people never inquire into the causes of ill health, and never suspect that the art of right living has

to do with wellness and success, the only thing to do is to let in the light gradually, as you would let in the sunlight on weak eyes, until at length they come to exercise an educated vision and not, like the owl, to regard daylight as a failure simply because not accustomed to it. Such communities are to be dealt with patiently, because their stolidity results from want of knowledge in this particular direction. It is gratifying to know that one after another we find such districts coming to the apprehension of some needs which can only be met by obtaining information. In other cases there is felt need, and Boards which are constituted attempt to do something but fail either from lack of power or lack of pecuniary means. Boards, for instance, like that of Newark, pass ordinances in abundance and enforce some of them mostly because the persons concerned do not see fit to resist or to test the law. These operate only under the old law, never having adopted the laws accepted and adopted by several other cities. Elizabeth, New Brunswick, Trenton, etc., as large cities have called to their aid this more recent legislation, and so are on a par with the townships and smaller cities of the State in their power to enforce ordinances. The law as passed last winter was fully reviewed by able lawyers, and is now such as gives increased powers to those Boards organized under it, of which there are now about two hundred in the State. No case under it has yet been carried to the higher courts. The permanent efficiency of Health Boards and the application of the laws under which they operate will largely depend upon the judiciousness and intelligence of the Board itself, and the ability of the citizens to comprehend the need of their work. Health Boards must always expect that their methods and their acts will be criticised. It is human nature for persons to assume an uttitude of resistance toward any one who questions a man's right to do as he pleases with his private property, or who suggests that it harbors a nuisance. The way to overcome this is to have clear reasons for what is done, to do properly what is to be done, to avoid wasteful expense, and to combine firmness with expediency. Then whatever resistance individuals may offer, a constituency will always be found to claim that a householder has no right to maintain a nuisance to the injury of his neighbor, and that public perils to the public health must not only be removed when existing but prevented when possible.

Some of the more important duties of local Health Boards have already been set forth in the circular of May 10th, 1881, as contained n the fifth report.

It is important that all these Boards should understand both the scope and the limitations of their sphere and of their powers.

Some of them are disposed to advocate the conferment of greater powers upon the State Board, and such as would give it certain local authority.

It has always seemed to this Board that its work should be, so far as local authority is concerned, co-operative and advisory, rather than mandatory. Local Boards should have large local authority, and should be aided by the counsel and influence of the State Board. But local government in such matters is best sustained by popular favor, or, if not, the locality must suffer the consequences. There are certain rare cases in which local neglect may so imperil the citizens of the State at large as to justify plenary power on the part of the State authority, but such instances of jurisdiction should be well defined.

A local Board that does not expect to meet with some opposition and occasionally to be unsuccessful in its efforts, ought to die, just as any man ought to die who expects that radical efforts for good will not be opposed. There ever will be those who, from habit, have become content with unhealthy conditions and surroundings, and do not know the dangers to health and to life incident to their situation. Others, from prejudice and because these evils have not, as yet, produced a severe visible effect, doubt the opinion of those who advise them, simply because they are unaware of the facts. Others have to struggle for a livelihood and are disturbed at any proposed change, lest it shall entail additional expense as well as toil. All such need to be taught and persuaded, if possible, since their resistance is more their misfortune than their fault. Many such have come to know the sanitary adviser is their best friend, and, by warding off diseases, aids them in comfortable living. A more disturbing class is that which fears to oppose evils because the opposition is unpopular or may interfere with personal aspirations. Yet how many such have come to find that aid to the public health is good policy as well as good propriety. Another class is made up of those who have accumulated property and so oppose improvements in order to avoid taxation. We do not complain that such should narrowly watch their financial interests. But the way to do this is not by opposing what ought to be done, but by guarding against all extravagant expenditure and improving their property by advocating those measures which conduce to the health and the growth of the community in which they dwell. What ought to be done is an expert question, on which most persons

are not competent to sit in judgment, unless they have professionally studied the subject. Their chief office is to see that what is declared to be necessary by those of competent skill, is done with thoroughness and at only such cost as is reasonable. The inertia of ignorance or prejudice is a dead weight, which can only be lifted by proper efforts at information, supplemented by the force of law. Political or pecuniary considerations often give way before the progress of facts. The steady progress which has been made in lowering death-rates in many cities often dispels the objections of popular leaders and of landlords.

A great work can be done by local Boards in acquainting the people with the causes of ill-health, and in providing ways and means for the prevention, as well as for the abatement of nuisances. Systems of local inspection are of very great value. Where a nuisance is contemplated or being arranged for, a Board can often prevent or restrain it. In cases of actual nuisances, not so rapid in their operation as to be suddenly dangerous, the local Board may deem it best to proceed by seeking injunction or by complaint before a grand jury. For some cases this is undoubtedly the most effective method, and needs the action and co-operation of the local Board.

Sanitary law is of two kinds. The abatement of nuisances is fully recognized as belonging to common law, and as to be procured under its provisions.

But as there are cases requiring more summary proceeding, and which would be practically irremediable, either by reason of the great expense or the slower processes of common law, national, State and municipal authorities have recognized the necessity of conferring police powers and summary rights upon sanitary officers. These are not arbitrary, except so far as most summary proceedings are arbitrary. If wrong is done, there is subsequent redress. Quick action is allowed, because a greater wrong to all society is imminent unless such powers are conferred. No laws have a better right to take their place among police measures than some of those relating to sanitary jurisdiction, since no peril can be more serious than such as sometimes invades the public health.

In our own State it was not to be expected that the enactment of new laws conferring such powers, would be without some opposition and even without some difference of judgment on the part of courts. It has taken several years in England, in Massachusetts, in New York, in Michigan and other States, to settle the point that a Board

of Health has the full right to declare what is and what is not a nuisance, and to proceed as if their decision were final. Also, that the judgment of a nuisance in such cases is not of the nature of a trial, and warrants summary proceeding. It is recognized that in our own courts some of these points are yet to be decided. But, in the meantime, there are abundant functions for local Boards to exercise in the interests of the people. Points which are now doubtful will meet their right issue when a sufficient number of litigations have occurred to test decisions. Laws and precedents have growth as well as sciences and arts, and there will yet be decisions inconsistent with former ones, only because the garments which well fitted the childhood of sanitation are not adapted to an increased stature. Special suggestions to local Health Boards will be found in connection with the Summary of the Local Reports.

HEALTH OF OPERATIVES.

The consideration of the influence of trades and occupations upon the health of those engaged in them is very important. It is always to the interest of a State to reduce to a mininum the burdens of the working classes. The oppression of having to live in unhealthy houses, amid foul streets and alleys, without means for the removal of filth, is no slight burden. The man, woman or child who goes to a day's work ought to be protected by law from those taxes upon health and vigor which are not necessarily incident to his or her employment. English law has wisely passed a series of acts known as factory laws, and appointed government inspectors to secure proper protection to operatives. It has besides, made, thorough inquiry into offensive trades and occupations and the modes of remedy or alleviation.

"If a thorough inspection should be made into all our mills and shops, it would be found that the health of many operatives was suffering from working in too crowded rooms and from impure air. It would be found in many quarters that there was a great want of proper ventilation, that in basements or lower floors there is frequently a dampness that is unwholesome; that in some rooms the temperature is too high and in others too low for health; and that in certain kinds or stages of manufacturing, the air is impregnated with steam, vapor, gas or particles of matter that are injurious to health. While it may not be easy to remedy all these evils, yet when the principles of sanitary science become better understood, far greater attention will be paid in every kind and department of manufacturing to those laws, the *violation of* which impairs health and shortens human life."

Instances of this kind have already been noted by us in hatting and pottery, and are known to exist in glass-blowing, leather and other industries. We are glad to find here and there a factory which has not overlooked these interests, but as a rule there is great defect in methods of ventilation, in regulation of temperature, in caring for dust and floating particles, etc.

STATE-HOUSE.

During the fall a careful examination was made of the sanitary condition of the state-house. The building itself in its location has many advantages, although exposed to some of the evils of soil-pollution and saturation which obtain in the part of Trenton in which it is situated. The basement and cellar portions are guarded by good walls and cemented floors, and there is some effective drainage about the building which either discharges into the sewer pipes or direct into the water-power at the rear. The surface water and the gathering from roofs find exit in the same way.

The heating is by steam, and indirect except for office rooms. Outside air is supplied to the furnace. The air is heated mostly under the first floor and distributed by registers to the building. Part of the year a fan is used to force currents of air over the radiators. An exhaust fan also is used as necessary. Sometimes when rooms are overheated the steam is shut off from the radiators, and cold air passes through the same channels. Hot or cold air can be let under the raised floors of the legislative halls. So far as apparatus is concerned, all hot and cold air is let in from or near the floor, except that in the Assembly room there is also a register about four feet from the floor. A ventilating stack surrounded by heat aids in the inside ventilation.

The basins, water closets and other arrangements for removing soiled liquids or matter of any kind are of various patterns, and the rooms or places in which they are located of various degrees of propriety. The most objectionable is that nearly opposite the room No. 5, on the first floor, which is not well ventilated and has poor closets. Those on the third floor are of similar construction. At least four or five forms of closets are to be found, some of which should be early removed and others ere long be replaced by some form of Hopper closet. Direct and self-operating Hopper closets are used in the basement. Buildings used irregularly, and in which constant and close housekeeping inspection cannot be always fully exercised, generally do better with a form of

closet having little apparatus and no receivers where solid particles can gradually accumulate out of the reach of the flush. When such material is lodged in the pan or valve space, and above the trap, its decomposition will cause odor at each use. Traps are mostly of the usual S variety, or the Adee, and are located near the basins.

The pipes from the various closets are connected with three different main soil pipes conveniently located and running from top to bottom, and so joining the outside sewer pipe, to be emptied into the water-power below the water level.

There is here considerable defect as to ventilation. These cast iron soil pipes do not run out at the roof so as to have air vent there, and have no opening for air at the bottom or in all their course to the water-power. It is now well understood that every main soil pipe should have, besides its outside trap, a ventilating pipe at or near its entrance into a building and another opening on the roof, so as to secure a constant presence of fresh air, which is the best preventive of and neutralizer for sewer gas. Some ventilation is afforded by the entrance of the roof-water leaders into this system, but this is not deemed enough, and especially as it gives no bottom opening, and as during storms these openings become filled and tend to syphon traps. Other minor points have been noted to the officer in charge. It is believed that with a few inexpensive but important changes, the general system as now existing is safe under such efficient oversight as it receives. There is no artificial apparatus or appliance for ventilation in the various rooms and halls, except that the legislative halls have adjustable openings in the ceiling and the gas fixtures are made to aid in ventilation when lighted.

Both the heating and ventilation of the building have been planned with considerable skill, but must depend very much upon administrative care. So little of it is automatic that ill judgment might easily produce draughts and great variation of temperature. The engineer in charge seems fully to comprehend the machinery and its management and to adjust it with skill, as also to appreciate some minor defects. The heating and ventilation, especially of the legislative halls and Supreme Court room, require much judgment. When cold northwest winds prevail the regulation is often difficult.

The water supply is direct from the general water works and satisfactory, except that some of the closets cause unnecessary wastage. There is no fire escape for the upper rooms and no fire extinguisher on the premises.

SANITARY EXHIBIT.

The sanitary exhibit of the present year was the best which has ever been made in this State. It has now been held for four years, in connection with the annual fair at Waverly. It has helped to acquaint our people with various devices for heating, ventilation, sewerage, the care of garbage, and the many other conveniences needed in connection with household life. The same kind of work is now being done by other means. The American Public Health Association is giving its encouragement to a great national exhibit, probably to be held in 1884, under the auspices of the Naval Museum of Hygiene, at Washington. Although the exhibit has involved but small expenditure, it has probably answered its most important purposes, and will not need to be sustained permanently.

The New Jersey Sanitary Association has continued to hold its annual meeting for the presentation and discussion of the various sanitary topics affecting the interests of citizens of the State. In the death of Ashbel Welch, C. E., of Lambertville, and that of Dr. H. A. Hopper, it has lost two of its most active and valued members. While many of the measures it has advocated have received public and legislative attention, it still has a sphere of usefulness. Some abstracts from its most valuable papers will be prepared for the next report.

Several additions have been made to the library, a list of which will be found by reference to the catalogue.

GRAVE-YARDS AND CEMETERIES.

The experiences of the past show the importance of careful consideration in the selection of burial places. The geological structure of the earth, the character of the soil, its water-bearing strata, its slope, and its deep and effective drainage, have much to do with its adaptability. There is great difference in the capacity of ground to dispose of the products of decay. Cases have been brought to our notice where school-houses are located at or very near burial grounds, or where basements of churches, located in among graves, are used for school and meeting purposes. A hot furnace, in such a place, may do much harm.

Burial grounds within cities often become a source of evil. This became so apparent in London that one of the first health efforts was

to get rid of burial grounds, or limit intra-mural interments. As there is a great tendency to form cemetery associations and to select burial sites, there should be some law or some Health Board power by which these selections shall not be made without careful consideration of the interests of the living, and of the future growth of cities. In one county in this state two cemeteries have been reported as causing sickness, as shown by statistics. The Weehawken Cemetery has required legal proceedings on the part of the authorities of Hudson county. A communication as to it on file in this office and accompanied by affidavits, gives series of facts such as show it even now to be a great public peril. There are many cities in which cemeteries should not be located within several miles of the present city. Cities for the dead should be chosen where cities for the living are not likely to come. Where these choices have already been made, much is to be done by way of regulation.

There is also laxity in the réception of bodies by sextons or the keepers of some cemeteries. It should be a law that no burial should take place in any grave-yard of any church or denomination, or in any incorporated cemetery, until a certificate of death or permit has been *shown* as well as procured, and the name of the person buried, the date of the burial, and the name and post-office address of the undertaker or other person in charge, should, at the time, be registered in a book kept for the purpose. Such provisions are not unduly troublesome, and, with the certificate recorded by the State, greatly aid in guarding life and the rights of property. Here and there a county grave-yard has an unknown burial. Such cases are not for the public welfare, and the interests of the State require protection against such occurrences.

The whole subject of the location and management of cemeteries is so vitally related to the interests of the living, and the evils of interments amid close population are so great and so difficult to remedy afterward, that we have deemed it expedient to have, as a part of this report, a thorough article upon the subject. Besides, it will be found to contain much bearing on the origin of pestilences, and on the methods by which the air we breathe is contaminated, and so life is embarrassed or destroyed.

CONTAGIOUS DISEASES OF ANIMALS.

The Board, in its oversight of the contagious diseases of animals, has had the co-operation of the Agricultural Department at Washington in guarding and inspection of cattle arriving from the South, and the assistance of five experienced veterinarians. Much of our effort is in the way of watchfulness and prevention. By correspondence with local Boards of Health, by an early investigation of reported or suspected cases, and by prompt measures in case of the outbreak of disease, we have been able to aid in preventing any wide-spread epidemic. Pleuro-pneumonia has occurred the last year only in the borders of Union and Essex counties, and has extended to but three farms. In one case we found it necessary to secure indictment for breach of quarantine, but in general, instructions are carefully followed out.

The cases in Morris county in a herd of one hundred head, which were under quarantine at our last report, did not extend beyond that herd. Inoculation in that case seemed to check the spread of the disease. Some improvements in method have been recently introduced. We have received the following letter in reference thereto from the most distinguished authority in England, Prof. Geo. Fleming, F. R. C. V. S., of the Royal Veterinary Service: "Inoculation, as a protective measure for bovine contagious pleuro-pneumonia, has been and is now most extensively practiced on the continent of Europe and in this country, and there is no evidence that inoculated animals, while suffering from the immediate effects of the operation, can communicate the disease. There is only one such instance recorded (it is found in my Vet. Sanitary Science and Police), but the circumstances attending it throw great doubts upon its correctness. I, myself, discredit it. I have absolute faith in the effects of the operation, as a prophylactic measure, and would most certainly counsel its adoption when the disease prevails—subject, of course, to suitable precautions as to the time and manner of performing the operation. This should be as carefully attended to as vaccination is with children."

Many cases are reported to us, which, upon investigation, prove to be some other malady. The outbreak of malignant anthrax which occurred in Salem county at the close of last year, did not extend beyond the place at which it occurred. At Secaucus, in Hudson county, there was, in October, a similar outbreak. There have been two outbreaks of the Texas cattle disease in the State—one in Bur-

lington county and one in Salem county. Both were in cattle recently brought into the State and the disease did not extend. In one case of a large herd we found it necessary to kill four cattle. As the meat of cattle affected with this disease is not considered fit for use, cases of the disease need especially to be guarded in the interests of public health. Cattle-owners and dealers should be on their guard against this disease, and newly purchased cattle should not at once be turned in with the general herd unless the full history is known. *Post mortem* examination of these cases is always interesting, not only in its relation to general animal diseases, but also to such as affect human beings. All the more because, by many authors, the inception of this disease is associated with imperfect water-supply and long-continued exposure to a malarial atmosphere. All these comparative studies are attracting more and more attention not only as respects food-supply, but in their analogies and elucidations of human diseases.

The disease of swine known as pneumo-enteritis or hog cholera, has prevailed in three or four localities. It seems persistent as an endemic, and recurs in pens in which it has proved fatal. The directions as to it, in Circular E of this Board, need to be borne in mind. While thus far the execution of the last law as to contagious diseases of animals has not involved much outlay, it is to be remembered that if pleuro-pneumonia or other contagion should occur but in a few valuable herds, it might require considerable outlay to stamp it out. Therefore, too much caution cannot be used by way of prevention. While inoculation to prevent contagious pleuro-pneumonia is recognized as allowable under direction of the Board, it is to be remembered that if not guarded it may become a means of spreading the disease. Any attempts to do this without such surveillance will be promptly dealt with. During the past year the Board has been able to make some arrangements with the New York authorities which remove some of the former embarrassments in transporting milch cows and calves to the New York market, and also to facilitate the transfer of imported cattle to this State for convenient quarantine. Further comments on contagious diseases of animals will be found in Circular F accompanying this report, and in the report of the State Board of Agriculture for this year.

VARIOUS LAWS AS COMMITTED TO THE OVERSIGHT OF THIS BOARD.

The service of the Board in its execution of the general constituting act and in its relation to the Bureau of Vital Statistics and the law as to contagious diseases of animals, is outlined in its appropriate connection as shown by the index.

The change made in the law relating to the adulteration of milk has seemed to work well. The Board is able to commend the efficiency of the inspector. Although it has no relation to the executive administration of the law, it asks and receives a quarterly report of the work attempted. The report of the milk inspector as given with this report will embrace fuller details.

The law to prevent the adulteration of foods and drugs failed of an appropriation last year, only because of a technical defect in the act. The balance left from the former year was small, but has been used with benefit in securing examinations and reports from two of the members of the council of analysts. These will be found valuable as guarding against common adulterations. We believe that it is desirable that this work be permanently sustained by a moderate appropriation. While the State may not deem it advisable to adopt so thorough a system as that of England and of two or three of the American States, there should be a method of apprising our people of the more injurious adulterations of foods and drugs, as these lead to much ill health and impairment of labor power, especially with the families of the industrial classes, who are the greatest purchasers of falsified foods.

The law passed by the last legislature as to the sale of petroleum and its products has been executed in accord with the terms and intent thereof. Its restrictions were made fully known to dealers and to the local Boards of Health. Cases of accident have been carefully watched for and the Board has held itself in readiness to deal with any infringements. The proper apparatus was secured for testing the quality of oils. It is the opinion of dealers as well as our own observation that the law has aided in bringing into disrepute the lower grades of oils, and has protected our citizens from these dangerous impositions. While the law does not secure a paid inspector or enable the Board to sustain a uniform system of detection, it does place into the hands of local Boards of Health the power to prevent illegal sales and to punish those who, as dealers, may cause accidents by the careless vending of forbidden grades.

The law relating to the sanitary inspection of State, county or township alms-houses, asylums, prisons, jails or other public institutions, has been found to authorize an inquiry very important in the interests of the citizens of the State. A special paper on this subject, as a part of this report, will give the details as to the work which has been done. If a plan of State oversight could be devised which would secure a faithful and prudent visitation and advisement, and which would secure to all these institutions the results of more recent knowledge in dealing with the defendant and criminal classes, it would be a wise outlay of time and money. As a rule the State institutions are managed much more intelligently than those of smaller districts.

In accord with the law as passed last year, this Board has urged upon the trustees of the State Normal School the importance of definite instruction in the care of the health of teachers and pupils. Until those who are to have the care of our public schools come to know more about the actual requirements of health administration, and how to guard the physical welfare of those in the schools committed to their care, there will continue to be great lack in this important department of knowledge, among the children and future citizens of the State. Two circulars relating to the subject have been issued, and the Superintendent of Schools has aided us in securing the attention of all district schools thereto. We still hope that a system of definite training and teaching will be adopted by those who have administrative control of the higher educational institutions of the State.

The duty of making inquiry as to such statistical information as is furnished by the national census, in order to make it available for our own semi-decennial census has been performed. We have on file in this office many schedules which will thus be of value as guides to a proper examination.

Various other laws relating to public health have found a place upon our statute books; as these have become known to us we have given to them such direction and influence for good as we could. As a rule, however, laws that relate to public health duties which are passed without any provision for their enforcement, soon cease to be obeyed and so do not accomplish the objects for which they were framed.

The law of last year, (ch. CLV.), more closely defining the powers of local Boards of Health and the mode of procedure where a Board of Health notifies of a nuisance which the owner fails to abate, avoids

some of the constitutional objections which had been made to the modes of exercise of power given under former laws. It is believed that the action of local Boards under this law will be sustained in all cases where no irregularity of procedings occurs.

There is still some need of legislation as to the status of local Boards in their relations to other authorities in the same precincts, to prevent that clash of judgment as to rights of jurisdiction which sometimes occurs.

VACCINATION AND SMALL-POX.

The prevalence of small-pox throughout the United States and its occurrence in various localities in this State during the period included within this report and the previous one, have made it incumbent upon the Board to turn special attention to its prevention, and especially to re-examine all details affecting the methods of vaccination. This was all the more important because of the active discussion which has been going on as to the relative merits of the Jenner or humanized lymph, and that more recently known as the bovine lymph. The later method by which the lymph is propagated from calf to calf and so a supply secured, has led many to enter upon its production as a business. Thus, as never before, the vaccinator has found himself exposed to the risks of unskilled or careless or fraudulent supply. Many other questions have arisen which, although they do not discredit the power of real vaccine lymph to protect against small-pox, require careful statement, and should lead us, in our answers, to indicate how this most efficient and indispensable preventive can be most extensively and successfully applied. In addition to two circulars in our last report, and to many replies and directions to various local Boards, we have sought, from several competent sources, replies to a *Memorandum* of inquiry as to *Vaccination*, as contained in the Fifth Report of this Board, (p. 339), as also such other facts as are especially important to members of the medical profession and to the people at large. Some of the members of the Board have made the subject one of special study and investigation. In addition, we have sought the opinions of several acknowledged authorities, among which we have selected such as seems to us of present service to the citizens of the State.

Dr. T. F. Wood, of Wilmington, North Carolina, has been for many years a close student of the subject, and furnishes brief replies to our memorandum. Dr. E. L. Griffin was one of the earliest prop-

agators of bovine lymph, and by his careful methods, his accurate knowledge and his reliable faithfulness, has done much to test and vindicate the value of genuine bovine lymph. His answers to the memorandum are, therefore, very valuable.

A few additional notes by E. J. Marsh, President of the Paterson Board of Health, form a part of this series of opinions and answers. Answers and a summary by the Secretary also accompany these replies.

It is believed that we thus put on record facts and opinions which will be a safe guide to vaccinators and to the people in seeking the protection of this great preserver from disease, disfigurement or death. While the Board does not endorse the views of each individual, so far as preference or the ground of preference for the kinds of lymph is concerned, it believes that from the material thus presented the best information can be derived.

Information as to the sanitary condition of localities, a summary of such local reports as are of special interest, statements from the milk inspector and from the council of analysts, and other papers containing valuable directions in the interests of public health, are herewith submitted for the guidance of individuals and households, of municipalities and townships, in matters which pertain alike to the welfare of families and of the State.

PAPERS AND REPORTS.

I.—SMALL-POX AND VACCINATION.

BEING IN ANSWER TO THE FOLLOWING MEMORANDUM OF QUESTIONS IN THE FIFTH REPORT:

I. Should the use of bovine lymph supersede the use of humanized lymph?

II. What phenomena, if any, have occurred in the use of bovine lymph, as distinct from what has been heretofore noted as to the humanized Jenner lymph? Such as (*a*) time of maturity; (*b*) degree of sickness; (*c*) proportion of local to general effect; (*d*) as modified by the number of pustules; (*e*) as showing herpes or other skin irritation; (*f*) as to period of protection, etc.

III. Are we able to arrive at any law as to how frequently vaccination should be repeated?

IV. Should there be a law of compulsory vaccination?

V. How far should *revaccination* be insisted upon in attendance at public schools?

VI. How far can we determine the efficacy of the vaccination by the scar?

VII. Should we not adopt the plan of giving certificate of vaccination, so that the facts as to its proper doing may be more fully known?

VIII. In what way shall practitioners be assured of the purity and freshness of lymph?

ANSWER I.

BY THOMAS F. WOOD, M. D., SECRETARY NORTH CAROLINA BOARD OF HEALTH.

"I. Should the use of bovine lymph supersede the use of humanized lymph?"

The employment of bovine lymph at the time it was introduced by Dr. Martin (1870), solved a question which was then becoming momentous—where shall we get reliable vaccine? It averted a disastrous crisis, by returning to the fountain-head for our supply. We need not recount the history of the attempts at the establishment of the practice of animal vaccination; suffice it to say that this regenerated lymph has been sought after by the best practitioners at all times, so as thus practically to admit its validity. Even most of those who were wedded to the Jennerian plan confess the necessity for regeneration.

One of the strongest arguments in favor of animal vaccination is that if it is pursued carefully by skilled and honest propagators, it puts at rest the fear of a vaccine famine, and it keeps the lymph up to the highest attainable degree of activity and purity. It is a fair inference that the purest and most active lymph is the stock from which we must look for the highest degree of protection. It remains now to inquire, is it practically true that bovine lymph is superior to humanized lymph? My answer is in the affirmative.

1. Bovine lymph gives all the results of original vaccinations as described by Jenner, W. Willan and all the earlier writers. It runs its course in the same uniform way, with the exception that the vesicle is a little delayed in its first stage, and the resulting cicatrix corresponds to the oldest record of a typical form.

2. The percentage of successes with bovine lymph (as high as 70 in my experience) in revaccinations of persons originally vaccinated with humanized lymph, demonstrates the superior potency of the former.

3. In the experience of many reliable observers, the course of humanized vaccine through a long series of years, is to depart from its typical form, and therefore afford less and less protection. The history of the practice of vaccination affords us numerous instances of the necessity of reverting to the original stock, to accomplish which retrovaccination, variolation and the discovery of new stock have been eagerly tried. If it were a practical experience in 1836, when the Passy lymph was introduced, and if it were a practical experience during the late war, then we may reasonably look for its recurrence when we depart for a sufficiently long time from the original stock. In this view of the case, resort to bovine lymph makes us sure that we give the person vaccinated the highest degree of protection.

4. There are other practical considerations which should lead us to

discard arm-to-arm vaccinations, when bovine lymph is to be obtained, viz., humanized lymph has been the medium for the transmission of syphilis,* (authority of Mr. Jonathan Hutchison); of erysipelas; of scorbutic ulcers, (authority of Dr. Jos. Jones and Dr. James Bolton, in the Confederate armies.) Bovine lymph is absolutely free from such results. Doubtless the transmission of syphilis is greatly exaggerated, but that it has been done at all, points out a danger that we should take into consideration.

5. Bovine lymph can be procured in any desired quantities, of standard uniform quality, at a reasonable notice.

The reasons in favor of arm-to-arm practice are, for many considerations, sufficiently valid. Up to an unascertained limit, which I may state to be the tenth to the twentieth remove, humanized lymph shows no deterioration. Its effects are milder. It "takes" more rapidly after the inoculation. It is a matter of convenience when bovine lymph is not at hand. It is very seldom that any bad results are detected, such as the transmission of syphilis, &c., from the use of humanized lymph or crusts. It has been almost the sole reliance of the Local Government Board of Great Britain for seventy-five years, and in a country where vaccinations are done faithfully, and show excellent results.

"II. What phenomena, if any, have occurred in the use of bovine lymph, as distinct from what has been heretofore noted as to the humanized Jenner lymph? Such as (*a*) time of maturity; (*b*) degree of sickness; (*c*) proportion of local general effect; (*d*) as modified by the number of pustules; (*e*) as showing herpes or other skin irritation; (*f*) as to period of protection, etc."

Vaccination with bovine lymph has brought to light a series of phenomenal symptoms, except to those medical men who have kept fresh in their minds the descriptions of Jenner and the early writers. Jenner described the disease caused by early removes from the cow, and he, consequently, gave a picture of only the intensest forms of it, in his "Inquiry" and "Further Observations." A glance at the colored engravings in Jenner's great work, in Woodville's, Pearson's, Bryce's, Willan's and all others, shows that the vesicle was larger, and the areola more intensely red than in the cases familiar to us up

* Also contagious porrigo. See Hebra's plates Diseases of Skin; Atlas of the Sydenham Society.

to the time of introduction of Beaugency lymph. The reader of the early vaccinographers can hardly believe there was not some exaggeration in their descriptions of the serious constitutional symptoms, and the bad ulcers which sometimes succeeded vaccination; ulcers so bad, indeed, that they had to be treated with solution of white vitriol.* Pass along until you come to the history of the cultivation of vaccination by Bousquet, (1836), and you will see that his attention was arrested by the opportunity he had of comparing vaccine vesicles cultivated from arm to arm during many successive generations, with the Passy cow-pox, then recently discovered. His pictorial comparison speaks volumes upon the natural history of cow-pox, leading us to the conclusion that vaccine, cultivated from arm to arm, after a certain limit has been obtained dwindles in size of vesicles produced and in the duration of the disease. In fact, showing conclusively that vaccinia introduced into the human subject is in a foreign soil, and will, after a limit, (still unknown), run so low as to require a return to the original seed from the native soil. This is a practical matter, having its analogy in the cultivation of seed in foreign soils. The medical men who were only familiar with this deteriorated vesicle, coming to look upon it as the typical one, very easily conclude that vesicles of bovine lymph are abnormal and unnecessary. And, furthermore, having only in mind the trivial disease caused by an attenuated lymph, they do not put their patients on their guard when vaccinating them with bovine lymph. The consequence is that the patient takes no forethought to protect himself by rest during the fever, or to protect the vesicle from harm.

(*a*) Bovine vesicles mature more slowly than old humanized lymph, dropping the scab from the twenty-fourth to twenty-eighth day. It destroys the cutis vera and leaves a well-marked cicatrix. Decanteleu's beautiful tables of cicatrices show just what we have resulting from bovine vaccinations. We are enabled to go back and examine vaccine cicatrices in the generation immediately succeeding the introduction of vaccination. The foveolation in cicatrices is no more characteristic than the ovoid cicatrix with a convex centre, radiated and with a deep non-foveolated margin. Really, the foveolation accepted by most practitioners as typical, is not a peripheral foveolation, but the depression of the hair follicles scattered over the face of the cicatrix.

* Jenner's "Inquiry."

(*b*) and (*c*) The degree of sickness is generally greater following bovine vaccination. The local effect of the active vaccination is in proportion to the constitutional effects.

(*d*) The number of pustules modifies the constitutional troubles up to a certain point.

The eruptions incident to bovine vaccination are the surest indication of the identity of the present cow-pox stock with the early Gloucestershire stock. One need no longer be surprised to see a general eruption during the course of a typical bovine vaccination, if he will consult Jenner, Willan and other early writers. The defenders of vaccination in its struggle found great difficulty in explaining away the general eruptions produced.

As to *period of protection* from bovine lymph, there is, as yet, no evidence, because a sufficient time has not elapsed to determine. This one fact has been demonstrated, that the proportion of successful revaccinations is small in persons who have received bovine vaccination as much as ten years ago; while the 70 per cent. of revaccinations is not unusual among those who had previously received the long-humanized lymph.

"III. Are we able to arrive at any law as to how frequently vaccination should be repeated?"

There is no law absolutely limiting the protective power of a vaccination. It is safe to say, with our present knowledge, that a person vaccinated in infancy with bovine lymph or a short remove from it, and revaccinated at puberty with lymph of equal value to the first, will be secure for a lifetime from small-pox, and, in most instances, from any degree of varioloid.

"IV. Should there be a law of compulsory vaccination?"

It would be well if every person could be compelled to receive vaccination. But it is next to impossible to execute a compulsory law. Our chief work in this direction should be by example, and by informing the people what vaccination really is.

"V. How far should *revaccination* be insisted upon in attendance at public schools?"

Revaccination should be resorted to in all times of public peril

from small-pox, in schools and elsewhere, except in those cases where a fresh and typical scar, together with the history of the patient, satisfies the vaccinator as to the amount of protection.

"VI. How far can we determine the efficacy of the vaccination by the scar?"

The scar, when fresh and typical, is strong evidence of the protection of the subject, although it should be received with some limitation. There are many instances in which the subject has but a faint scar and has absolute protection, as proven by exposure to small-pox. It is the best evidence we now have, and if the vaccinator will carefully study the different scars and keep them in his mind, he certainly, if he can get a true history as to previous vaccination, will seldom make a mistake. Decanteleu's rare chart of vaccine cicatrices ought to be very familiar to every vaccinator.* This was one of the earliest questions discussed. See Steinbrenner's *Traité sur la Vaccine*, p. 658.

"VIII. In what way shall practitioners be assured of the purity and freshness of lymph?"

The evidence of purity of vaccine depends very much upon the knowledge of the subject the propagator possesses and his honesty. In bovine lymph there is no way to determine its purity and freshness except by actual use. As to the estimation of the value of a humanized crust, we can speak with some certainty. A good scab is semi-transparent, mahogany colored, and, when fresh, moist, and when a little older should be brittle. It is odorless, free from blood. It should represent vesicles which have not been tapped. Any departure from the dark mahogany color, especially if the crust be light and friable, should be taken as certain evidence of impurity.

[See in full on this point accompanying note at close of this article, pp. 42–3.]

If hereafter any revulsion should seize the profession in the United States, and they were absolutely to abandon bovine vaccination, the good that has been accomplished will be felt for a quarter of a century, by reason of the excellent stock that has been

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* See Dr. H. A. Martin's report on Animal Vaccination, in the volume of Am. Med. Ass'n Transactions for 1877.

distributed all over the country. In fact, if that day should come, the progressive mildness of the sores and facility with which the lymph would "take," would probably lead the American profession to conclude, as it led the English profession, that animal vaccination is "much less successful than vaccination with humanized lymph." Seaton's Hand-Book, p. 951.

A fragmentary treatise on Vaccine Cicatrices,* published in 1851, now very little known, and, at the time of its publication, but little esteemed apparently, deserves to be studied with renewed interest, as it really contains more information on vaccine cicatrices than can be found elsewhere. Decanteleu had received the appointment of Sanitary Inspector of Schools in 1845, and being perplexed by the meagreness of the current knowledge as to the typical standard of vaccine cicatrices, he set about working out the problem himself. At that time the accepted description was as follows: "The veritable cicatrix is round, depressed below the level of the skin, studded over with depressions of diverse forms, formed by irregularly disposed rays or furrows." Reason and observation demonstrated to him that vaccination could result in cicatrices of numerous and varioloid forms, and very different from those described in the medical works. In order to attain his end he performed a great number of vaccinations, studying with care the results, determining rigorously their character, and finally studying with scrupulous attention the mode of formation of the succeeding cicatrices. During seven consecutive years he pursued this investigation, watching, recording, and taking impressions of five thousand four hundred and twelve vaccine cicatrices.

In order to make his work more complete, impressions were made with pasteboard paste and glazier's putty. In this way he procured a rich and curious collection. From these moulds were engraved one hundred and twelve figures. In order to make it more complete, a second column was added to his table of figures, placing the cicatrices of ecthyma, burns, leech-bites, small-pox, furuncles, carbuncle, acne, blisters and cauteries, side by side with the vaccine cicatrices.

The first part of the work comprehends the following heads: 1, the form; 2, their dimensions; 3, the configuration of their surface,

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* "Monographie des Cicatrices de la Vaccine, accompagné d'un tableau i'conographique, contenant 112 figures disposeés méthodiquement," par J. E. B. Denarp Decanteleu: Paris 1851, p. 32.

the accidents noticed, their color, their characters, their nomenclature; 4, their affinities; 5, their differential characters; 6, their classification; 7, their diverse transformation; 8, the degradation of their forms or types; 9, the degradation of type in the same subject; 10, co-existence of the different kinds in the same individual; 11, the relative frequence of divers kinds on the same subject; 12, the influence of age, constitution, weight, texture of skin, certain skin diseases, on the aspect, dimensions, accidents and color of the cicatrices.

The second part considered: 1, why some vaccine cicatrices are round, some oval; why, in the oval form, the long axis is parallel with the axis of the arm; 2, the diverse dimensions, and on the same subject; 3, the varied configuration of their surface, the punctated and the *figured** (gaufrure); 4, why the recent cicatrices are generally concave, and how they can undergo divers and numerous changes; 5, cause of the degradation of forms in different individuals and the same individuals; 6, how cicatrices of different types can exist in the same persons; 7, in what manner age, constitution, corpulency, texture of skin, skin diseases, influence the type, aspect, dimensions and color of vaccine cicatrices.

In the 5412 cicatrices examined, 3493, or 65 per cent., or nearly two-thirds, were round; 1919, or 35 per cent., little more than one-third, were oval.

It was also observed that these two forms could exist separately or together. Thus, on 1000 subjects, 47.5 per cent., nearly one-half, presented only round cicatrices; 190, or 19 per cent., had oval cicatrices only; and 335, or 33.5 per cent., a little more than a third, presented a mixture of the two forms, combined in very variable proportions.

DIMENSIONS OF VACCINE CICATRICES.

The dimensions of round cicatrices vary from 4 to 20 millimetres, ($^3/_{20}$ths to about $^{15}/_{20}$ths inch.) The greatest number (1136) measured 7 millimetres, (about ¼ inch) in diameter; and the next greatest number (795) measured 6 millimetres, (little less than ¼ inch); and the smallest number measured 20 millimetres, (more than ¾ inch.)

* Gauffrure—having irregular cellules on the surface, like the markings in a waffle. There seems to be no exact word.

REMARKS.

A critical study of Decanteleu's figures of cicatrices, leads to the conclusion that, industrious as he was, his work was incomplete. Some casts in my possession from some cicatrices found in the persons of German subjects, resulting from vaccinations of thirty years ago, show that there is a valuable number of varieties left entirely out. These are round, with clean-cut borders, ⅛ inch in diameter, depressed, whiter than the surrounding skin, but distinctly foveolated. This I believe to be typical of a vigorous humanized lymph, several generations removed.

The convex cicatrices are very numerous after animal vaccinations, and many of the forms he gives are now common. They must have been rare in this country when this work was written, (1845), and their frequency can be accounted for by the discovery of several cases of cow-pox, from which their stock was drawn; the Passy case, in 1836, being the one nearest this date, just nine years before his studies were commenced.

ANSWER II.

BY EZRA M. HUNT, M. D., SECRETARY NEW JERSEY STATE BOARD OF HEALTH.

It is not the design of this article to debate the question whether small-pox has been limited and prevented, and is to continue to be limited and prevented, by vaccination. The fact that Edward Jenner discovered a system of introducing what is known as the kine or cow-pox will be taken for granted. In 1798 he published his "Inquiry into the causes and effects of variola vaccine," and about 1800 Dr. Waterhouse, of Boston, procured vaccine lymph direct from Jenner. Ever since, vaccination has been practiced in this country.

As to the power of vaccination in influencing small-pox, we quote from "The Truth about Vaccination," by Ernest Hart of London, (1880), and refer those anxious for more details to this brief treatise:

"Eighty years' use of vaccination has proved beyond doubt that, 'duly and efficiently performed,' its power of influencing small-pox is, indeed, almost absolute, that it acts, not invariably by preventing, but sometimes only by controlling that disease. The vast majority of those who have gone regularly through the vaccine

process are saved thereby from any future attack, however modified or slight, of small-pox. In the minority, who have not been rendered by it completely proof against the influence of the small-pox poison, the action of that virus is yet so modified that the small-pox, as a rule, is deprived of all danger to life, and does not leave behind it those disfiguring traces which are not the least of the terrors of unmodified variola. There is certainly no subject on which medical testimony is more unanimous than on the very large immunity from attacks of small-pox which successful vaccination will confer. A vast body of evidence which was collected by the Epidemiological Society in 1851-52, from all parts of the kingdom and from abroad, showed that vaccinated persons placed in circumstances in which no unvaccinated or otherwise unprotected person, or scarcely any such, escaped (*e. g.*, persons living in crowded and ill-ventilated dwellings in which the small-pox infection existed, occupying the same rooms, and sleeping in the same bed with small-pox cases, mothers nursing their babies who were suffering from the disease,) yet remained themselves entirely unscathed."

Taking it, therefore, for granted that there is such a thing as protection from small-pox, by the process known as *vaccination*, our first practical inquiry is, *from whence is the material for the operation to be secured?*

To this three answers have been given, each of them so correct, that probably the preference must turn upon relative points and questions of expediency.

The lymph used by Jenner, and which was the means of introducing the art of vaccination to the world, was derived from an eruptive disorder found on the udder of the cow, which, after painstaking research, he learned to distinguish from other eruptive diseases also sometimes found on the udder. He found by actual experiment that when the lymph was introduced into a child, it was preventive of small-pox.

He also found that it was not necessary always to procure the lymph direct from the cow, but that in passing through human subjects it did not lose its power. Hence came the use of "humanized vaccine lymph," which, it is abundantly proved, in the course of eighty years or more has protected tens of thousands of persons from the small-pox.

The second source from which effective vaccine lymph has been derived, is such as has resulted from the introduction of the virus of variola or small-pox into animals and then using the modified lymph of the vesicles so produced for human vaccination. No doubt the fact that Jenner himself regarded the kine or cow-pox ("variolæ vaccinæ") as a modified small-pox, first led to this class of experiments. It is true that this source of supply has been doubted, because of many negative experiments, but the evidence of Gassner, Sonderland (1830), Thiele (1836), Robert Ceeley, of Aylesbury, Mr. Badcock, of Brighton, and their acceptance by such authorities as Simon, Seaton, Buchanan,

etc., the successful repetition of Ceeley's experiments in this country, in 1840, by Dr. Horatio Adams, of Waltham, Mass., by Dr. S. Knight and Dr. Wm. C. Van Bibber, of Baltimore, (1852), and the fact of the continuously successful use of vaccine derived from such sources for a long time afterward, seems to leave no reasonable doubt that, if need be, a fresh vaccine lymph can be thus secured. As, however, there could be no advantage from an attempt to secure vaccine lymph from such a source at this time, and as some risks similar to the former risks of inoculation might attend it, it only seems interesting to us as starting the question whether, after all, the alleged cases of spontaneous kine or cow-pox had not a human origin.

The third source from which effective vaccine lymph has been derived, is from a case of spontaneous cow-pox known as the Beaugency stock (1866), lymph from which, propagated from calf to calf, was introduced into this country in 1870, as also possibly from some other stocks of spontaneous cow-pox which have been authenticated. (We do not include in our enumeration a vaccinating lymph which was procured by introducing humanized vaccine lymph into calves, and so an attempt made to refresh by this culture, and which was known as Lenoix's lymph, and for a time used with some success.)

Practically, as we now have to deal with vaccination, the only question to be determined is, shall we insist upon using lymph known as the Jenner lymph, transmitted by successive human vaccinations, or shall we use the lymph from more recent cases of spontaneous cow-pox, cultivated or preserved by being transmitted from calf to calf, instead of from person to person? (After having compared these two, a subsidiary question also arises, viz., whether we shall in all cases use this more recent lymph transmitted from calf to calf, or whether, having this supply, we shall not select our best results in children, and so use also humanized lymph of this more recent stock.)

1st. As to the Jenner lymph.

The criticisms made upon its use relate chiefly to these three points:

(*a*) Its enfeeblement of protective power by reason of its long use and so distant remove from the original supply.

(*b*) The possibility of conveying thereby some disease which has existed in persons from whom the lymph has been taken.

(*c*) The difficulty of obtaining enough to meet the emergencies of epidemics.

Under the first point (*a*) the statement of the case is this: It is alleged by some that you may take the lymph from a normal vesicle,

at the proper time and in the right way, and insert it into the flesh of unvaccinated persons and have an apparently good vesicle therefrom, but that of one hundred or more so vaccinated, more than in the early years of vaccination will contract genuine or modified small-pox not very long after, and still more will be protected for a shorter period than formerly.

The strongest statement made in confirmation of this view is probably that furnished by Dr. Cameron, of Dublin, and to be found in the Fortnightly Review, May, 1881.

In all such examinations it is to be borne in mind that even if the fact seems to be established, we are first to inquire whether it is not owing to some incidental or accidental modification of effect, and are not to assume that it is owing to any inherent deterioration of "vesicle" power. If so, and if we are able to eliminate these restricting or disturbing results, it does not at all affect the integrity or usefulness of the original methods. The errors made in the adoption of a system do not at all affect its real value, if only these errors are capable of identification and removal. The art of the physician is to recognize the errors and their sources, and to secure that precision of procurement and insertion which shall insure success.

After some careful examination of the subject, we are unable to collect any series of facts which show that in the oft-repeated removes from the first vaccinations in Jenner's time, or in that of his immediate successors, there was apparent any change in the character of the vesicle, so far as concerns its efficiency. Even oftener than now, the test was made by the direct exposure of vaccinated persons to the contagion of small-pox. Ever since, physicians and nurses without number have relied upon this protection without any consideration of the number of removes from the original stock, and have had the proof which such a test furnishes, that this vaccination is fully protective against small-pox.

With so much evidence as there is on which to postulate a law that genuine vaccination of this kind is protective from small-pox, where a case of apparent exception has occurred, such questions as these are in order:

Was the vesicle from which the lymph was taken a genuine vaccine vesicle, and the lymph in a proper state for transfer?

Were all the usual phenomena of a perfect vaccination realized in the case of the person under observation?

Was the vaccination that of a single vesicle and without any appa-

rent constitutional impression, so as to raise the point of defective quantity rather than of deteriorated quality?

Have such cases been so rare as to make it legitimate to class this as an idiosyncrasy, since we recognize that to many laws there are occasional inexplicable exceptions which do not invalidate the general law?

These questions are started here not with the intent of their full answer, but as a caution that when careful and continuous observation and testimony seem to have authenticated a law, we are not to give such force to a few phenomenal or apparent limitations as to lead us to doubt its existence. Imperfections in details do not mar the primal fact. It generally occurs that these failures or variations are capable of explanation, and that there is no need to discredit the written judgment of those who have formulated the law, and by the fullest observation established it.

The fact that some persons have contracted small-pox after having had it once before, does not at all affect the general statement that one attack of small-pox is protective against a second. With the many possibilities that arise as to the genuineness and extent of a vaccinating effect, it is not surprising that some persons who have been vaccinated have an after-attack of small-pox or varioloid, yet the fact remains that, as a rule, the Jenner vaccination is fully protective against small-pox. Such is the belief of a very large majority of vaccinators.

PERMANENCY OF EFFECT.

Our second inquiry has reference to the question whether there has been any diminution in the time in which genuine vaccination affords protection.

If vaccinia is a modified variola, or even if not, and if any of the analogies, as measles, scarlatina and others of the class of diseases to which small-pox seems to belong, apply to it, it would be proper to entertain, as a working hypothesis, the idea that a vaccination which, at the time, exhibits its full effect, would continue to be operative throughout the whole of the subsequent life. The fact that in very many persons it has been and is so operative, can scarcely be gainsaid, and adds to the probability that the protection is usually lifelong.

If sufficient exceptions multiply upon us, we are not at once to conclude that the law must be set aside, but are to start and settle such inquiries as these:

Is there full and sufficient evidence that the original vaccination was such, in all particulars, as would have satisfied Mr. Jenner and the earlier disciples of vaccination?

Was it at all tested at the time by what was formerly so much the crucial method of immediate revaccination, to know whether the system failed to respond to a repetition?

Is it certain that when we get what seems to be a true vesicle from a repetition with bovine lymph, that the person was not protected or that what you may choose to assume was a feeble protection, would not have prevented his taking of the small-pox?

Is it certain that the sore produced is a genuine vaccine vesicle, and uninfluenced by anything that has preceded it? Or, if undoubtedly genuine, can we not ascertain a law of change in the individual or in his climate or surroundings, that accounts for the effect and recognizes him rather as an explicable exception than as a breach of the law and a reason for its denial?

Such inquiries behoove the accurate students of the subject who are seeking to be exact, and who form judgment upon sufficient testimony rather than upon the bias of their own few cases.

For, when we come to turn back to old authorities and see the precisions and tests of original vaccination, and the sources of error that we may need to eliminate, we must not too hastily conclude that there is *usually* a limitation of effect, or that revaccination under the same conditions as those of its early performance is required at briefer intervals than in the time of Jenner. There is a strange lack of such evidence as would commend itself to a medical judge and jury, if all of us were called upon to submit our cases to such a decision, and to give a reason for our views with meekness and fear.

We believe that Jenner was right when he said of vaccination: "Duly and efficiently performed, it will protect the constitution from subsequent attacks of small-pox as much as that disease itself will. I never expected it would do more, and it will not, I believe, do less." Seaton's Hand-Book, p. 178.

II. The second point of possible objection is the possibility of transmitting by or through vaccination any disease which has existed in persons from whom the lymph has been taken.

That by some condition of the person vaccinated some form of irritation may occur, or that eczema or other skin disease may be developed has always been granted. But results have been in thousands of instances so benign, and the protection from small-pox so complete,

that there are but two diseases as to which impression enough has been made to take the form of serious objection.

These are erysipelas and syphilis. The occurrence of erysipelas has never been claimed as peculiar to vaccination. Any scratch upon the body may be the occasion of an erysipelatous disease, or the introduction of parts of a crust or of some irritating foreign matter, distinct from lymph, may produce it. The probabilities or possibilities arising from this disease have been very carefully studied, and a full analysis of cases has never authenticated this disease as a valid reason for neglecting this protection from small-pox. It is a very rare result.

Most physicians do not believe it possible to communicate hereditary syphilis by genuine lymph. The grounds for suspicion in this direction have been so doubtful that a large majority of vaccinators still doubt if cases of alleged syphilis have not been the result of the accidental introduction of syphilitic poison, by the direct application of the virus to the puncture or abrasion, or afterward by rubbing or scratching. The general view has led to this form of statement:

1st. While syphilis is an inoculable disease, it is probably only inoculable by its own primary infection, which the child could not have, except as the syphilitic virus was introduced directly from the parent or some other source by direct contact.

2d. It is not known that inherited syphilis can be communicated through vaccination. If it could be, inasmuch as inherited syphilis is a disease, the existence of which is declared within six months after birth, this remote possibility could be vacated by choosing a supply from children of an age beyond that time.

"In foreign countries attempts have again and again been made to decide by experiments whether vaccination, from persons obviously ill from constitutional syphilis, will communicate syphilis to the recipient; and it is, to say the least, a very remarkable fact that in not one of these experiments has anything like syphilis resulted. With the well-attested experiments which now stand on record we are obliged to doubt whether vaccination, *i. e., genuine and simple inoculation with vaccine lymph*, from however syphilitic a subject, can possibly communicate syphilis, or, at the very least, whether some stage of the vaccine vesicle more advanced than vaccination rules allow to be proper for lymph supply, or some admixture of blood with vaccine lymph such as careful vaccination never permits, must not be a condition for such possibility." See Hart, p. 291. "During the twenty years in which there has been systematic inspection of public vaccination in England,

some millions of vaccinations have been performed. But in no single instance have the government inspectors of vaccination been able, after the most rigid inquiry, to find one single case of syphilis after vaccination." Hart, p. 27. Is not Dr. Seaton correct in saying *that the danger*, if indeed there be any at all, of communicating through vaccine lymph, as in an ordinary well-performed vaccination, any other infection than its own must be so infinitesimally small, that for all practical purposes we may regard it as non-existent?

Our third query relates to the difficulty of obtaining enough Jenner lymph to meet the emergencies of recurring cases of small-pox. This certainly has become a serious inconvenience. With the exception of the supply from Dr. C. H. Leonard, of Providence, Rhode Island, which Dr. E. M. Snow of that city has been so careful to perpetuate, it is now quite difficult in this country to be sure of a supply from the Jenner stock. While we cannot accept many of the objections made to the Jenner lymph, and believe by perfect care and propagation it would continue to protect, even if we never had discerned the method of perpetuating calf or bovine lymph, yet when we come to examine still further we shall hope to show some reasons why, at the present day, it is as practicable as it is safe for us to trust chiefly to the bovine supply, and to concentrate our efforts in preserving it from those unskilled and commercial embarrassments to which it is exposed.

We therefore next pass to inquire whether the lymph now especially known as bovine lymph, is reliable, as carrying out the intent and accomplishing the purpose of the Jenner system of vaccination, and how its completest effectiveness is to be secured.

While it must be admitted at the start that the use of the recent animal lymph has not yet been very long or been subjected to the accuracy of experiment which has been exercised as to the Jenner lymph, there is no reason to doubt its great value as an addition to our sources of supply. It vacates any cavil as to the possibility of the transmission of human diseases, which has been alleged as to the humanized lymph, and enables us to secure a larger amount of supply, fresh and ready for use. On the other hand, the very fact of large demand and active production sometimes begets carelessness as to methods, or passes its production and sale into the hands of those who have no expert relation to those nice experimental questions which greatly concern the physician and his patients. While we do not admit the necessity of its use by reason of the loss of any original power in the Jenner lymph, we regard it as an addition to our stock

of such advantage as now to be regarded as our most important supply.

We have thus answered the first inquiry in the memorandum of this Board, as found on page 339 of its fifth report.

In answer to the second inquiry of the memorandum, as to the phenomena which have occurred in the use of bovine lymph, as distinct from what has been heretofore noted as to the humanized Jenner lymph, we note as follows:

(*a*) The time of maturity is less uniform and generally more prolonged. Dr. Wenning, for instance, of the Cincinnati Academy of Medicine, (see Cincinnati Lancet and Clinic, 1882, p. 113,) vaccinated on the same day in the same school, about forty children with bovine and eight with humanized lymph. Some of the bovine lymph did not produce its effect until the fourteenth day, while the human took in the usual time. Dr. Hewitt, of Minnesota, informs me that during an epidemic in his state the contrast was so marked that in the cases of those who had been exposed to contagion he uniformly used the humanized lymph, in order to anticipate the prodromal stage of small-pox. In the Privy Council report of 1854, under a page headed "Signs of Successful Vaccination and of Successful Revaccination," being the description of Gregory, as revised by Ceeley and Marson, it is said "when lymph is employed which has recently been derived from the cow, the resulting phenomena, as compared with the previous description, are somewhat retarded in their course; and the areola is apt to be much more diffuse. There is, also, more feverishness but eruption is less frequently seen." P. 12.

(*b*) The degree of sickness is, as a rule, greater in a genuine bovine than in a humanized vaccination, and quite corresponds to Jenner's statement, made as to his own cases. This, when arising from perfect lymph, is regarded by many as a proof that the constitutional effect is more pronounced. If it were possible always to know that this sickness results from the pure lymph alone, and was not modified by the condition of the system or from other causes, the amount of sickness would be a test of the constitutional effect. As it is, the experience or judgment of the vaccinator must be relied upon to determine its exact significance.

(*c*) *The proportion of local to general effect.* It is not probable that recent bovine lymph has anything peculiar to itself as distinct from the Jenner lymph, so far as the relations of local to general effect are

concerned. The local effect, as well as the constitutional, is regarded as likely to be more pronounced in the use of the bovine lymph, but this probably depends somewhat on the amount of lymph introduced, as we shall see under another heading.

(*d*) "*As modified by the number of pustules.*" We are still in need of statistics on this point sufficiently accurate to be comparable with those already on record as to humanized or Jenner lymph. (See English Reports for 1861, by Drs. Seaton, Stevens, Sanderson and Buchanan.)

As a sample of the importance attached to this, we find that under the English vaccination method, the registrars kept record of the number of marks. Thus Dr. Seaton, in his report for a half year, (June to December, 1860,) has the following in his return:

With typical marks, 2882,	3 or more,	1036.
	2 " "	1219.
	1 " "	627.
With possible marks, 3485,	3 " "	1262.
	2 " "	1447.
	1 " "	776.
With bad marks, 1889,	3 " "	606.
	1 " 2	1283.

In the next report (1861), after an additional examination of over 19,000 cicatrices, he says: "The conclusion that 29 per cent. of children nominally vaccinated were very imperfectly protected against small-pox, and that another 37 per cent. had only a comparatively moderate degree of protection, is a very serious one, and would be still more serious if it had appeared to depend upon causes beyond control." Having only one or two marks was called by some the "half-vaccinating" custom. Care was formerly taken to have the insertions about three-quarters of an inch apart, so as to distinguish the vesicles from each other.

There can be no question that in the use of the Jenner vaccine it was important to produce more than one pustule, and that both the degree and permanency of the effect had some relation to the number of vesicles or pustules which filled with lymph. Often punctures used to be made sufficiently apart from each other to give opportunity to trace the development of each one. It was and still is the general judgment of the medical profession that a number of pustules is desirable, because more fully assuring the degree and permanency of protection. It is objected by some in respect to bovine lymph, inas-

much as its effect is more active than that of Jenner lymph, that the introduction of a larger quantity makes the operation itself more hazardous. It is a question of much importance whether we ought not to adopt what used to be known as the Bryce method, from the plan of Mr. Bryce, who, soon after Jenner's discovery, introduced vaccination into Scotland. So soon as the activity of a single insertion or puncture had been manifested, he revaccinated at another point. If, in due time, this showed some effect, he repeated it again, and so on until no effect was apparent. It was a fact that when the second or third vaccinations produced an effect, the latter insertions, which came to anything, matured nearly "consentaneously" with the first that had taken.

Dr. E. Warloment, Director of the State Vaccinal Institution at Brussels, and perhaps the most successful practitioner of animal vaccination, says: "When a child is brought back at the expiration of the first seven days, if it be revaccinated on the spot, even with its own vaccine lymph, it may be that there will be a fresh eruption, feeble for the most part, but occasionally showing all the signs of classic vaccinal pustule. What conclusion is to be drawn, if not that the first inoculation, insufficient to protect the subject against a second vaccinal impregnation, was *a fortiori* insufficient to guard it against variola? Hence the necessity of fresh insertions until the complete exhaustion of vaccinal receptivity. This is what I term *vaccinization*. Thus every child brought back at the end of eight days should be revaccinated on the spot, even with its own vaccine, if it be in proper condition. If this second vaccination answer well, a third should be performed, and so on, till the patient be completely *vaccinized*. I have a decided conviction that if this practice were followed, if all children were *vaccinized*, the immunity from small-pox would be much greater than at the present time; and it is, perhaps, from my having constantly put it into practice that my successes have been so constant, and the result of my vaccinations so thoroughly satisfactory."

Because it is not always easy to determine the genuineness of a bovine vaccination, because we do not perfectly know how far a local effect indicates a complete constitutional effect, we think it would be a valuable addition to present methods of practice if it were usual to repeat vaccination in a few days, even where what seems an adequate effect has been produced. Nevertheless, there is little doubt that a single vaccination, properly performed with bovine lymph, does, with

rare exceptions, protect the person who has been vaccinated from small-pox.

(e) *As showing herpes or other skin irritation.* It is not generally claimed or admitted that bovine lymph of the more recent stocks and transmitted from calf to calf, is any more likely to produce dangerous irritation than is the Jenner lymph. Like the original cow lymph, as used by Jenner, it is more active in its effects, and therefore is more liable to excite local irritation, and to be the occasion for the appearance of some eruptive disorders, to which the person may be inclined. Whatever danger there may be of the conveyance of any human disease from one human system to another, is avoided in the use of bovine lymph. It has never been alleged that any serious disease has been transmitted from the bovine to the human species. Although from the fact that some dermatologists believe that a mild form of herpes has been thus transmitted, students of bovine vaccination should be on the watch against the remote possibility. In reference to the "nævus-like" looking proliferation which sometimes is formed, Dr. J. B. Taylor, Inspector of Vaccination for the New York City Board of Health, speaks thus, (see Med. Rec., April 8th, 1882, p. 389): "It is virus beginning to deteriorate that produces the 'raspberry,' or, as they are more commonly called, fungus or abortive vesicles. The latter are cellular in structure, closely resembling a vaccine vesicle in all appearances, except as to color. This is a dark or dirty red, like a nævus. They appear a little later than a true vaccination and remain unchanged for from two to four weeks, when they dry up, forming a brown scab, which eventually falls off, *leaving no scar.*" We cannot say with the author that they cause no inconvenience. We think they are keloid in their character and need further investigation as to their cause. While they never have been found harmful, they are unpleasant, and of no value as a protection; from the fact that one observer has reported a large number of cases as occurring from the use of one stock of lymph, it seems to be not at all connected with any individual condition, but with some condition of the lymph used.

(*f*) *As to period of protection.* We see no reason to doubt the statement of Ernest Hart, that "by vaccination in infancy, if thoroughly well performed and successful, most people are completely insured for their whole lifetime against an attack of small-pox; and in the proportionately few cases where the protection is less complete, small-pox, if it be caught, will generally be, in consequence of the vaccination, so

mild a disease as not to threaten death or disfigurement. * * * In consequence of the large amount of *imperfect* vaccination which has until very recent years existed, the population contains very many persons who, though nominally vaccinated and believing themselves to be protected against small-pox, are really liable to infection." * *

We believe that a summary of evidence as to the Jenner vaccination goes to show that, as a rule, where persons were properly vaccinated with the genuine lymph, and to a degree that showed constitutional effect, as tested by repeated vaccination before the first vaccination had separated its crust, such persons were permanently protected from small-pox. Also, so far as present evidence goes as to bovine lymph, it is equally strong, or, as some would claim, much stronger. This prepares us to pass to the answer of the third query of the memorandum—"III. Are we able to arrive at any law as to how frequently vaccination should be repeated?" Our answer to this is, if we were able to know that the first vaccination was performed by a skillful person, and found satisfactory by him, and especially if tested by revaccination at the time, we believe, in the vast majority of cases, the protection is permanent. Jenner, in his day, gave a case to show that some perceptible effect from lymph inserted long after does not prove that the person would have contracted small-pox. Arriving at the age of puberty, or change of climate or of constitution, does not again subject a child who has had measles or scarlet fever to a new attack.

We believe that Jenner was correct in his claim that a child fully and properly vaccinated was for life protected from small-pox as perfectly as if he had once had the disease, and that the same is as fully true of genuine bovine lymph as procured by transmission from calf to calf.

But the *practical question as to the necessity of revaccination is quite different from the theoretical one.*

Whether from imperfect vaccination at the time, imperfection of lymph, imperfection of skill in the vaccinator, or of care in observation, the neglect or impracticability of repetition at the time, or from some other possible cause, it must be admitted that the common judgment and consent of the medical profession at present is that revaccination should be had at or about the age of manhood or womanhood, and that in the presence of an epidemic or special exposure, it is the part of proper precaution to repeat it. Personally we base this view only on the judgment that since we do not, in most cases, know all

the details as to protection, it is not worth while to run even a minimum of risk of so serious a disease as small-pox. But we are not able to arrive at any "law" as to how frequently vaccination should be repeated.

IV. We do not at present favor a general law of compulsory vaccination, because we believe the object sought can in this state be attained better in other ways, taking it for granted that a primary vaccination is always insisted upon. As children are those of the most susceptible age, and in their mode of aggregation at school, furnish the most hazardous materials for epidemics, and as the privileges of the school are the gift of the state, it is wise and proper to require of teachers and scholars vaccination as a condition of attendance.

V. How far should revaccination be insisted upon in attendance at public schools? is the fifth question of our memorandum. This depends largely upon the period which has elapsed since the first vaccination, the evidence of its genuineness, and the intensity of the epidemic, or the degree of exposure in particular cases. Where the vaccinator or the source of the lymph are unknown, or there is want of evidence as to degree of protection, revaccination is generally to be advised as safer. But whether a child who has not been or will not be revaccinated, shall be excluded from the school, must be left to the judgment of physicians and to the action of local boards of education or school trustees.

Revaccination is to be urged chiefly on the ground that the first vaccination may not have been exhaustive, and that in the presence of an epidemic it is not worth while to run any risk.

VI. How far can we determine the efficacy of the vaccination by the scar?

In general this may be answered by saying that the efficacy of a vaccination largely depends upon its quantity and quality, and that the scar as examined by an accurate observer informs much as to these.

When we review the large amount of evidence furnished by Jenner and his contemporaries, and examine the records of the English Blue Books and the consentient views of such observers as Marson, Ceely, Seaton, Sanderson, Simon, Stevens and Buchanan, it is surprising how far attention to these items has ceased to be exact.

In 1863 Dr. Seaton begins his report by saying: "We begin by assuming, as now proved beyond shadow of doubt, that the number

and typical quality of vaccine scars are the elements which denote efficiency of protection against small-pox. Without waiting for the new evidence of this relation that will presently appear, we assume that every vaccination should be performed according to the rule of the council which directs at least four good-sized vesicles, or an equal amount of local effect to be produced. From the above tables it is seen that not more than one hundred and eighty children in one thousand had the high degree of protection that would be given by an obedience to this rule. Even if we admit their good cicatrices as constituting evidence of efficient protection, we find that scarcely more than a third part of the whole number of vaccinated children have received this degree of protection.

It is to be remembered that in all the earlier methods of vaccination, separate and successive punctures were made, and there was great accuracy of observation as to both the extent and quality of the result. The principles of test were well enunciated, after observations of tens of thousands of cases by various observers who found themselves in full agreement as to what did and what did not, both as to quantity and quality, constitutes the sign of proper vaccination. The opinions were formed by examination of the cases about the eighth day, as well as by examination of the cicatrices. Thus in the first instructions of the first report of the medical officer of the Privy Council, (1858), instruction third is, "vaccinate by four or five separate punctures, so as to produce four or five separate good-sized vesicles; or, if you vaccinate otherwise than by separate punctures, take care to produce local effects equal to those just mentioned." It was then largely the custom to have the child from whom the lymph was taken present, for immediate transfer, in the spirit of a letter of Jenner's written to a friend whose children he was asked to vaccinate, where he says, "Our arrangements must be carefully made, as the children must be met here by proper subjects for transferring the lymph, for on the accuracy of this part of the process much depends.'

The facts presented by Mr. Marson, in his report of 1856, after having been in charge of the London Small-pox Hospital for nearly twenty-five years, and the views of Mr. Ceely, of Aylesbury, both pointed to the necessity of close distinction between perfect and incomplete vaccination. Dr. Simon, emphasizing the importance of both (p. 54) the amount and the character of the mark, says: "The amount of vaccination scar or scars on the arm or arms of a successfully-vaccinated person ought decidedly not to be less than half, and is proba-

bly the better for reaching three-quarters of a square inch. It does not practically matter whether the quantity is got by the existence of one very large scar or by the existence of several smaller ones—a difference which depends on inessential differences in the mode of vaccinating." Mr. Marson's method is to make, about three-quarters of an inch apart, five punctures, not very superficial, each of which gives a vesicle, and eventually a cicatrix of circular form and of diameter varying from three-eighths to five-eighths of an inch. Mr. Ceely, using Weir's vaccinator, at four different spots, about three-quarters of an inch asunder, raises on each spot a compound vesicle or group of vesicles; and the result at each spot is a cicatrix of oval or elliptical shape, and on average about one-half of an inch long, by one-third of an inch broad.

"The quality of vaccination scar, to which too much importance cannot be attached, is that it shall be slightly depressed, and in its whole extent be dotted over with minute pittings." We do not agree with Martin in depreciating the import of these. One cannot read the description of the sizes of a successful vaccination as given by Gregory, and revised by Ceely and Marson, without seeing that in it they expressed that accurate knowledge which came from the closest observation of thousands of cases. Still, more, the four inquiries of the medical officers of the Privy Council, made by eminent men and including actual examination of cicatrices by the hundred thousand, as detailed in these reports, show that the number and quality of the "marks" is, to the skilled observer, quite accurately indicative of the value of the protection.

It is hard to rid one's self of the persuasion that the need of revaccination of the present day is mostly to be attributed to the uncertain character of some of the lymph, to the want of thoroughness in primary vaccinations, to the want of skill in judging of the requisite quantity and quality of the "sore," and "the vaccinator's low standard of what he ought to deem a satisfactory result of vaccination."

As the present habit of vaccination is not by distinct punctures, we need to judge more by the area of the cicatrix and by its indentation, (foveolation.)

Dr. Russell, the health officer of Glasgow, says: "The number of vaccine marks can have no meaning, excepting so far as they indicate, in a general way, the quantity of lymph introduced into the system. * * * I am inclined to think that the local and permanent phenomena which would best indicate the quantity of lymph introduced,

and, consequently, show even more striking relations to the mortality, would be the superficial area of good vaccine cicatrices."

An area of half a square inch is the size specified in the official report of Dr. Bridges.

It must be admitted that in dealing with bovine lymph we have not, as yet, determined, with the accuracy with which observers of the Jenner lymph thought they had determined, the significance of the cicatrix.

The small annular elevation of the lymph cells and the friable character of the crust, often perplex those who have, over and over again, seen so as to be sure that they know what has constituted a good Jenner vaccination.

From the variable depth and circumference of the vaccinal lesion even when uncomplicated, and its variation from local inflammation, both the area and the "foveolation" or pittings are obscured as to their significance. The graphic and accurate descriptions of the Jenner vaccination by Gregory, Ceely, Marson and Wilson, deserve to be recalled. (See English report, 1858, p. 30.)

It is true Dr. Martin is both positive and descriptive in his identification, but this perhaps, because of our mixed supply, is too accurate to correspond with the testimony of most observers.

While greatly hopeful over the evidence to be secured by more extended comparisons, and while not denying to the cicatrix some significancy, we must, at present, say that it is doubtful whether, from the cicatrix of a bovine vaccination, we can certify the perfection of the protection. Vaccinators should be studying cicatrices.

VII. *Certificate of vaccination.* We think the plan of a certificate of vaccination important. It identifies the time of the operation and the person performing it as can be done in no other way. This would often determine the question of protection or the need of repetition. It secures greater carefulness on the part of many vaccinators. England now has government medical inspectors, and certain of the medical licensing bodies require evidence of tuition by one of the government teachers of vaccination.

A certificate of vaccination should state the number of vesicles produced. At present there is no definition of what is a successful bovine vaccination, too often any sort of vaccinal effect on the arm being regarded as a success. The certificate should give the time and place of its performance and by whom, and should state whether the lymph used was that of the Jenner stock, that from the calf direct or that

which is one or more removes therefrom; as also whether a crust or points have been used. All the better if the source of supply is also stated.

VIII. Our next question is: "In what way shall practitioners be assured of the purity and freshness of the lymph?"

The importance of being thus assured cannot be overestimated.

If the lymph is simply inert, repetition is required, and a want of confidence engendered. If small-pox is prevalent the first failure may expose the person and so the community to an attack of small-pox, which good lymph would have prevented.

If, besides the lymph, you have blood, serum or other foreign matter, or any organic substance in a process of decomposition or decay, there is the possibility of producing much unnecessary local irritation, and of introducing into a human system material which may excite disease. Also if a dirty lancet is used.

The possibility of obtaining unprotective or absolutely spurious and injurious lymph, does not weaken the argument for *vaccination, since there is such a thing as thoroughly protective vaccination*, since the material for it can be procured, since *what it protects from is one of the severest* scourges of humanity, a fearful tax on human life and on social and national progress.

But the fact of possible inertness or spuriousness does make it intensely incumbent upon the general government and the State to secure for its citizens right vaccination, to protect them from imperfect or spurious vaccination, and upon the members of the medical profession to see to it that in offering themselves as vaccinators, they be able to assure their patrons that they have a lymph which is both safe and effectual, in a timely and protective sense. For on these two conditions, one of which relates to the State and the other to the vaccinator, depend a very great public and personal interest to citizens, to families and to individuals. And it also behooves the vaccinator to know that both as to quality and quantity of effect, he has given to his patient the full benefit of the *completest* and longest possible protection.

It thus becomes a practical question, both to physicians and the people generally, how we shall have assured protection. Many physicians, feeling the importance and responsibility of the question, think that the general government should have a system which should insure against imperfect lymph. Others, that the State should in some way provide a lymph supply.

It has not been deemed advisable by this Board for it to enter upon any system of lymph production. It acquaints itself with and advises as to sources. Then also it sees to it that vaccination is promoted throughout the State, and that it is promptly resorted to when small-pox occurs. It has been able to aid much in this way.

In the case of the only vaccine farm in this State, it was found to be conducted by a city Board not in the limits of the State, and we could only make examination and pass judgment and give advice. It had objections and has now ceased to exist. In order to have a more assured certainty of lymph we have encouraged physicians to use that which has taken satisfactorily to themselves and is thus approved by their own selection.

We have also introduced into the State certain approved stocks of lymph, and placed them for propagation in the hands of responsible and capable physicians, as thus starting local centres of purity, to which we could refer and which we could authenticate.

When asked as to how the people shall know that the lymph is pure, we can only answer by saying that their confidence must rest upon the vaccinator, and is the same they exercise when they send for a physician and trust him that he will use the proper medicine and not make a mistake as to it. To assure its purity or to give the right remedy may cost him far more inquiry in the one case than in the other. But so long as there is the genuine article; so long as it is an indispensable requisite to protect us from a sad and disfiguring and often fatal disease, and so long as a skilled profession have both motive and competency to secure the protection, the reliance must be here. If finding a lack of ability to secure the needed protection, they must, through the people and in their behalf, appeal to the State.

For this we do not apprehend any present need. The two past years have witnessed a prevalence of small-pox, and an epidemic intensity very general in its character. No State has been more exposed thereto than our own. While it has broken out in fifty or more localities, it has in only three instances obtained much headway. In these its progress was mostly owing to neglect of adequate powers in local Boards, but was readily met when such powers were conferred.

The enormous demands for vaccine lymph throughout the country found the reputable producers of bovine lymph unable to meet the demand. Hence we have been exposed to the evils of an over-demand, which, in such an instance, could not but lead to unskillful or fraudulent production. With this experience, with increased knowledge and

with the great awakening of the medical mind, it is probable that the true and reliable sources of vaccine lymph will be more closely defined than ever before. Questions of preference as to methods and of the significance of lesions or changes wrought by the lymph, and of the conditions which limit or secure permanency of protection, will be examined with eager skill. If for the sake of brevity we may commend to others what we would say to ourselves, it is thus:

Do not forsake the Jenner lymph, on the ground that it has lost protective power.

Do not discredit bovine lymph because there has been occasional over-production and fraud.

In our zeal for the old or the new, let us not create a public feeling of distrust in this protection. Remember that there are enough reliable producers to make it competent for you to assure yourself of the reliability of your lymph. Do not let its supply take the form of a mercantile drug, since it is a commodity so special in its character as to need to be supplied more directly.

Watch closely the course of your vaccinations, and, to some extent, *depend upon yourself for supply by using lymph* that you procure after having obtained your original lymph from a reliable source, inserting it in a healthy child and having been satisfied with its mode of action.

Do not use crusts, except in a most pressing emergency.

During an epidemic, with persons who have been directly exposed to small-pox, use, if you can, at first Jenner lymph, on the ground of its greater rapidity of action, even if soon after, at some other point, you introduce the bovine lymph in order to test or intensify the effect.

Let us not allow the mere incidents or accidents connected with the use of either Jenner or bovine lymph to obscure the indispensable importance of vaccination or of protection from small-pox, the hazard from which is actually so great, while that from vaccination is infinitesimally small.

As a summary of the views submitted as a whole in this paper, we may add as follows:

SUMMARY AS TO SMALL-POX AND VACCINATION.

I. Small-pox, after complete vaccination, is as rare a disease as is a second attack of small-pox in the same person.

II. Where a vaccination has not afforded protection it may be owing

(*a*) to the lymph being spurious, or (*b*) deteriorated in quality, or (*c*) insufficient in the degree of saturation of the system, or (*d*) owing to some idiosyncrasy in the person. If owing to any of these causes, these cannot be said to establish any rule that limits the effects of proper and complete vaccination, since such causes admit of elimination or limitation to a minimum.

III. The protection afforded by vaccination depends much upon the fact that at the time of its performance it has been done so exhaustively as that weekly or bi-weekly repetitions with genuine lymph would not produce any effect.

IV. Revaccination at adult life is often but the supplementing of partial or inadequate vaccination in youth. The chief argument for it is the fact that present methods of first vaccination do not encourage repetition at the time. Revaccination is a wise precaution.

V. So long as there is no compulsory law of vaccination, and no system of certificate as to the perfection of primary vaccinations, revaccination is all the more important.

VI. Lymph from spontaneous cow-pox is, probably, not deteriorated from the mere fact of human transmission, and, therefore, that usually known as the Jenner lymph is still valuable.

VII. Lymph from more recent spontaneous cow-pox, transmitted through successive calves instead of through successive infants, is also a valuable source of supply. This may be used after transmission through persons who have not been previously vaccinated.

VIII. The risk of transmitting other diseases through vaccination is excessively small—is even considered impossible by many of the best authorities. Yet the time will never come when dirty methods of collecting or inserting lymph, or when the careless introduction of other material into the original sore may not transmit septic or irritating material, or when any scratch may not, in a very small fraction of exceptional cases, cause inflammatory or septic results. Such rare and avoidable accidents or neglect furnish no reason for neglect of a process which, for every risk it has occasioned, has saved tens of thousands of lives. The expectation of life to each individual is therefore increased by vaccination.

IX. The security against small-pox consists in the exact knowledge and care of medical men, in the performance of the operation only by competent persons, and in such general laws as favor or secure the purity of lymph and the prevalence of vaccination among children.

X. The only reason why small-pox ever becomes an endemic or an epidemic, is the neglect of complete vaccination.

ANSWER III.

E. L. GRIFFIN, M. D., PRESIDENT OF WISCONSIN BOARD OF HEALTH.

I. "Should the use of bovine lymph supersede the use of humanized lymph?"

Not necessarily so; perhaps not wisely so. Both are protective, indispensable, and, with wise safeguards in their selection and use, safe.

We would urgently recommend the use of humanized lymph of only a few removes from the heifer, when that form is used. When such a selection is made, the relative merits of animal and humanized lymph cannot be fully determined by any data we have at command.

We regard bovine lymph as possessing all the qualities of safety and protection which could be desired. The essential requisite in the use of either is a conscientious and intelligent care in their selection and use.

II. "What phenomena, if any, have occurred in the use of bovine lymph, as distinct from what has been heretofore noted as to the humanized Jenner lymph?"

(a) *As to variation in time of evolutions and maturity.* The period of incubation is from one to three days, generally, longer in the use of bovine lymph than where humanized lymph is used.

A relatively long period is generally observed before the vesicle reaches its several stages of development and maturity.

Retardation in the course of the vaccination is a matter of common observation. This peculiarity is generally thought to be caused by the insoluble quality of bovine albumen in the serum of the blood, and hence the slow action of the absorbents on the vaccinal granule. This delay is so marked in some cases as to cause great surprise, but I have never known any untoward results to follow. The same phenomena and from the same cause are sometimes observed where humanized crust is used. Generally, in the end the vesicle matures fairly, and we may reasonably infer that a protective influence has been secured.

The phenomena of successful vaccinations will present marked deviations in degree when observed in different individuals. The cause of this is to be looked for in the variations in the quality and vigor of the lymph used; in the varying conditions of health in the persons vaccinated; in their unsanitary surroundings and in mechanical interference with the normal development of the vesicle.

(*b*) *Degree of sickness.* The constitutional symptoms following the use of pure bovine lymph, and those induced by lymph humanized by a few removes from the heifer, are generally of a like character and degree. In the case of both, these symptoms are sometimes quite severe. The cause is quite often found in the condition of the patient himself. It must be admitted that during the past year an unusual amount of severe constitutional symptoms and local complications have followed the use of bovine lymph. Undoubtedly several causes have combined to produce these results—

1. A marked susceptibility, during a portion of the year, in the human subject, to the vaccinal disease, as well as to the variolous poison.

2. The use of bovine lymph of questionable purity.

3. The use of points which were packed and sent out for use, possibly before they were thoroughly dried. In such cases, some vital degenerative change might take place in the albuminous coating of the point, so that when such lymph was planted in the human arm a degree of septic action might be set up. Where orders were in advance of the crop, and impatiently waited for, such an accident is by no means impossible. All these evils are *accidental* and almost inseparable from a great pressure, such as was brought to bear upon all vaccine establishments during the winter of '81 and '82.

4. Faulty and unskillful methods of vaccinating, especially the one of scarifying too deep.

Simple as is the operation of vaccination, yet it requires a degree of technical skill rarely appreciated in or out of the profession. It is to be deplored that an operation so inseparably connected with the safety of human life should be entrusted to any but skilled hands.

(*c*) *As showing abnormal results.* The frequency of vaccinal erythema following the use of bovine lymph is a noticeable phenomenon. This constitutional manifestation of the vaccinal disease is seldom observed in the use of humanized lymph of distant removes from the heifer. It is a harmless affair, and only indicates a thorough saturation of the system with the vaccinal disease.

The phenomena of so-called spurious vaccinations are sometimes very annoying. The prevalent notion that these irregularities appear only after the use of bovine lymph is incorrect, for they were observed years before the introduction of animal vaccination.

While an apparently large number of spurious vaccinations were observed during the winter of '81 and '82, it must be remembered that the ratio was small, since the number vaccinated was simply immense, and this without regard to physical condition or sanitary surroundings, and that the service was rendered in many cases without skill or intelligence such as the importance of the operation demands.

A recent writer * has grouped together what may be called the *accidents* sometimes noticed to follow the use of bovine lymph, having their cause, as we have before stated, sometimes in the patient and his surroundings, and sometimes in the bad quality of the lymph used.

1. Red tubercles, the size of peas, appear at the seat of vaccination. These tubercles sometimes suppurate.

2. The vesicle commences with much itching and irritation. It is not umbilicated, but acuminated or conoidal, and contains straw-colored or opaque, instead of clear lymph. The areola is completed by the fifth or sixth day, and begins to decline on the eighth day, the scab falling off by the tenth day.

3. Instead of the usual papule or vesicle, a bulla containing a transparent fluid, and having a reddened margin, may develop. Troublesome ulceration sometimes arises beneath the crust, which is formed after the rupture of the blebs.

4. A crop of herpetic vesicles, preceded by shivering, may appear about the third day after vaccination. These soon burst, and the exuded fluid gives rise to an eczematous eruption, the skin becoming hard and œdematous. Intolerable itching accompanies the vesicle, and the axillary glands become enlarged.

5. Occasionally vesicles which have apparently run a normal course up to the eighth or tenth day, suddenly rupture, and ulcers, that spread both superficially and deeply, make their appearance. They cause pain or itching, and are accompanied by much constitutional disturbance.

These manifestations are always benign in character, and always end in complete recovery.

(*d*) *As to period of protection.* This cannot be definitely settled by

* Hardaway on Vaccination and Small-pox.

our present *data*. The history of animal vaccination is too brief to furnish opportunity for strict comparison. The evidence is strongly in favor of bovine lymph over that of humanized, *i. e.*, the long-used human lymph.

III. "Are we able to arrive at any law as to how frequently vaccination should be repeated?"

No. That must always, from the very nature of the case, be a matter of experiment. So much must be allowed in a given case for the varying vigor of the lymph used, for the possible imperfection of the operation, for the accidents interrupting the normal development of the vesicle, and for the varying degree of resusceptibility to the vaccinal disease, that nothing but repeated trials can test the safety of any person.

The test of revaccination should be applied at the age of ten or twelve years, and before that age under imminent danger. The trouble and cost of such a revaccination is so insignificant in comparison with the security gained, that it is one of the marvels of the age that so many neglect this duty.

IV. "Should there be a law of compulsory vaccination?"

We are not prepared to advocate such a law, although there are potential arguments in its favor. The partial application of such a law as applied to schools and public institutions is wise. In the present state of the public mind with regard to compulsory measures, it is very doubtful whether a more general law of a compulsory nature would be sustained. Educate the people as to personal duty and public obligation, and leave the burden of responsibility on the individual.

V. "How far should revaccination be insisted upon in attendance upon public schools?"

Undoubtedly to the extent of full protection for all the pupils. It could not be considered an unwise or objectionable rule to revaccinate all pupils when arriving at the age of twelve years. It might be found necessary to revaccinate younger pupils during a wide diffusion of small-pox in the community.

All doubtful primary vaccinations should be revaccinated. The genuineness of a primary vaccination must be determined by its history; by the appearance of the scar as to its typical or deficient character; by its quantity.

VI. "How far can we determine the efficacy of the vaccination by the scar?"

Only approximately. We need another factor to aid us, namely, the history of the primary vaccination. While much reliance can be placed upon a truly typical scar, together with a reliable history, giving a typical primary vaccination, we are obliged, in the final analysis, to fall back upon the test of revaccination to establish and assure our judgment.

VII. "Should we not adopt the plan of giving certificates of vaccination, so that the facts as to its proper doing may be fully known?"

Yes.

VIII. "In what way shall practitioners be assured of the freshness and purity of the lymph?"

If humanized lymph is desired, the physician must make his own selection and be his own judge. It is a wise way to procure a package of points of bovine lymph from some reliable propagator, and on carefully-selected children produce vesicles from which, on the seventh or eighth day, lymph may be taken of perfect purity and great activity.

In the matter of bovine lymph, great responsibility must always rest upon the propagator. No man should be allowed to propagate animal lymph for public use who is not a well-educated physician, of accredited and unimpeached integrity of character, and who conscientiously devotes himself to this service.

The perfect quality of animal lymph is a matter of so much importance to the public that its production should not be degraded to the level of a common trade, but be exalted to a sacred position in skilled labor. All vaccine establishments should be under the State or national supervision, thus giving, in a measure, a guaranty to the public.

No one can positively determine the purity and vigor of animal lymph by its physical properties. Some of the finest quality of bovine lymph is *amber*-colored. Some has a tint as if stained with blood. If such points are very heavily charged they have a suspicious look.

We make the following suggestions:

1. Purchase your lymph from some well-known, accredited and experienced propagator.

2. Order direct from the producer.

3. Order only in such quantities as will probably be used early.

4. Use dry-stored lymph upon ivory points or quill slips. Animal crusts are too unreliable and too liable to contain impurities to be recommended.

5. Vaccinate but one person with one point.

6. Do not carry the points about in the vest pocket. Body heat soon lowers the vitality of the lymph.

7. Reject such points as have evidence of containing impurity.

8. Study carefully your *methods* of vaccinating and seek to become skillful in the operation. Take time. Be patient. It pays.

Recognizing the infinite blessing of animal vaccine, it should be the constant effort of every physician to seek to reform such evils as are incidental to it and extend its practical usefulness to the human family.

ANSWER IV.

BY E. J. MARSH, M. D., PRESIDENT OF THE BOARD OF HEALTH OF PATERSON.

In compliance with your request, I will give you my opinion and the results of my experience on the various questions propounded on page 339 of the report of the Board for 1881, concerning vaccine lymph and vaccination. The first two questions can best be discussed in the reverse order, as the answer to the former will follow from the answers to the latter.

I. From the beginning of my practice up to 1873, I had used the humanized vaccine lymph exclusively. I had employed the arm-to-arm method, the fluid lymph in capillary tubes, the quills and the dried crusts—the last in a very large majority of the cases. The lymph was obtained either by myself or some professional friend, or from some institution of known character, as the New York Dispensary. I had seen two or three epidemics of small-pox. During these small-pox epidemics I was perfectly satisfied with the protective power afforded by this vaccine, (I mean in cases of recent vaccination), and I felt perfect confidence in my ability to protect any individual who might be exposed to the disease. I had seen no serious bad effects from vaccination; there had been a few sore arms—small, indolent ulcers, slow in cicatrizing, a few cases of subsequent eczema, and a few of convulsions in teething children. Moreover, the success of the operation had been good, failures in primary cases were very rare, and more than half the secondary vaccinations were successful. Since 1873 I have used almost entirely the bovine lymph, and this has been

obtained from Dr. F. P. Foster, Dr. H. A. Martin, or the New York City Board of Health. I began and have continued the use of this lymph for various reasons; the danger of conveying syphilis by vaccination had been much written about—a possible degeneration of the Jennerian stock and consequent diminution of the length of the protection conferred by it had been asserted, and it became a fashion to use the animal lymph and patients asked for it. In my use of bovine lymph it was observed that the vaccine vesicle resulting was much larger, the areola and inflammatory induration were more extensive, the crust large, flat and thin, generally ruptured, and came away before the sore was cicatrized. In two instances the inflammatory action was so high that the vesicle sloughed out *en masse*, leaving a deep ulcer. The constitutional symptoms were not more severe than formerly. There was a little more frequent delay in the maturity of the vesicle, but this was not generally marked. There was no more tendency to subsequent eruptions or irritations of the skin, but yet the only case of post-vaccinal erysipelas I have ever seen came after the use of bovine lymph; but this, in my opinion, is in no way attributable to the character of the lymph, but solely the result of the traumatism.

The operative success was not nearly so good as with the use of humanized lymph, and at one time failures even in primary cases seemed to be the rule and successes the exception. So much so, that I often felt and expressed a dread of dealing with another epidemic of small-pox. I felt I could not anticipate or promise my patients the same certainty of success and immediate protection as formerly. I desire to say, however, that recently my success has been much greater on account of adopting a rule of vaccinating with two points in every case, and now I have obtained very excellent results, one of the two abrasions almost always producing the vesicle. This unequal success is due, in my opinion, to the dilution of the vaccine lymph; the humanized lymph used is generally the pure lymph from the vesicle, or the same, dried in the crust; the substance on the quills or points of bovine lymph consists mainly of blood serum, with a very small quantity of vaccine lymph. As to which kind of lymph will protect the individual for the longer time, must be left for the future to decide. The time that has elapsed since the introduction of the animal lymph has been too short to allow of any decision in its favor, or to determine whether a single vaccination, in infancy, with this lymph will protect for a lifetime. For myself, I certainly would *not take* the responsibility of not advising a revaccination on reaching

adult age. As bearing on this subject, I will report that I recently revaccinated a child of seven and a half years whom I had previously successfully vaccinated in early infancy with animal lymph, and this revaccination was successful.

In accordance with my own experience given above, I find no reason why the bovine lymph should supersede the humanized, and I find many reasons why both should be retained.

Bovine lymph should certainly be retained; the protection it affords is certain, the absence of syphilitic contagion is certain, and on this account it can be used in some cases where prejudice would interfere with the use of the best humanized lymph. The most decided advantage it affords, however, is the ease with which the supply can be forced equal to any possible demands. With the sudden appearance of small-pox there is at once an enormous demand for vaccination, and the supply of vaccine is strained to the utmost and often falls short. By cultivating the lymph on cows and heifers, however, a supply can be obtained at a week's notice equal to any possible demand.

Humanized lymph should be retained, because it is protective from small-pox, because, with care, it can be guaranteed as equally safe as regards danger of syphilis, because it can be propagated by the physician himself, and because of its *comparative cheapness*. The last may seem an insignificant point, but it is not so. In some parts of the State the fee for vaccination is ridiculously low, and a physician who receives only fifty cents can scarcely afford to pay from ten to thirty cents for his material.

As to the way in which practitioners can be assured of the purity or freshness of the lymph: In the case of humanized lymph, it had best be propagated by themselves or obtained from physicians on whom they can rely. Bovine lymph cannot be thus obtained, but the supply can only be kept up by organized work. The procuring at all times an abundant and reliable supply of vaccine is of sufficient importance to be taken charge of by the State. This can be done either directly or indirectly. A vaccine farm can be carried on by the State Board of Health, or the same Board can officially inspect and certify to the character of the lymph supplied by individuals. This must not be all, however. This would provide good material, but it would not keep out the bad. No other lymph ought to be allowed to be sold or used in the State, except such as might be authorized by this Board.

We may not be able to arrive at any absolute law as to how frequently vaccination should be repeated, but we can, at any rate, establish a reasonable rule of practice. In ordinary periods it is neither necessary nor advisable to revaccinate before the period of adult life—about twenty years—but the operation should then be performed, and such vaccination and revaccination will almost certainly protect during the whole period of life. In times of small-pox epidemics, the revaccination should not be postponed beyond the age of ten years, and adults, who may have been revaccinated once successfully, should be advised, though not urged, to a second revaccination, partly to provide for the few exceptional cases and partly to redouble their own assurance of protection. Therefore I do not believe that *revaccination* should be insisted upon in attendance upon public schools. In ordinary cases the children are too young to be proper subjects for revaccination, and in times of small-pox epidemic, the local Boards of Health can enforce the necessary rules as to such attendance. Possibly it might be advisable to require successful revaccination as a necessary qualification for graduation.

Nor do I believe that there should be a law of compulsory vaccination. The enforcement of such a law would be very difficult in this country, on account of the slight police surveillance and the migratory habits of the people. Very few persons object to vaccination, and an equal amount of labor in offering vaccination would bring equally good results. Under the two systems, London suffers more from small-pox than New York. As a means of preventing small-pox, it would be totally inadequate unless it provided for thorough revaccination. I see no benefit to be derived from the giving of certificates of vaccination. The possible value of such a certificate would depend upon the ability and character of the physician signing it, and, in too many instances, would be worthless. In all instances of primary vaccinations (with very few exceptions), it would be of no more value than that certificate which is always given—I mean the scar. This may not be of positive value as to the protection afforded after a period of years, but it is of as much value as any written certificate could be. Certificates of revaccination might be of value in certain exceptional cases, where the resulting scar was small or indistinct.

DISPOSAL OF SEWAGE IN CITIES.

BY JULIUS W. ADAMS, C. E.

Having been honored by the request to furnish a paper upon the subject of the disposal of sewage in cities, I am led to confine myself to a review of the several schemes or systems which have been proposed to that end, as any attempt to illustrate the practical details of sewer construction would be somewhat unprofitable, unless given in connection with the systems in localities to which they severally related. This would carry us further than our limited space will permit. I have accordingly confined myself to an exposition of the several systems of sewering towns, in which, of course, there will be much which to engineers will lack the flavor of novelty—but I trust that the cause in which we are all interested, will not suffer by any attempt to bring the principles of the several systems clearly before the citizens of this state.

In the diversity of opinions which prevail as to the value of the several systems, the circumstances under which they grew up have an important bearing, and their history, going back a long way, for many centuries in some cases, is not uninteresting, and I had attempted to relieve the dryness of the subject by a rehearsal of some of these matters, which, after all, have but little practical value, and are inconsistent with my main purpose of *condensation*. I shall therefore omit their recital, and confine myself rather to what *is*, as of more practical importance than how it came about.

The end and object of works of sewerage are to remove the liquid and semi-liquid waste products of life from the vicinity of dwellings, before decomposition sets in, and in such manner that there cannot possibly be any harmful pollution arising therefrom, either to earth, air or water, and that the operation of removal shall give no offence to either sight or smell, and no methods be asked of the people, which

are likely to be neglected by the most refined, or by the lowest or most improvident of the population. Such is the ideal sewerage to which we aim to approximate; and that system or method which will, all things considered, promises the nearest approximation to this standard, in a given locality, is the proper scheme to be recommended.

The above standard presents the primary sanitary needs, which admit of the least possible compromise. The secondary and economical considerations, the value of which each community must judge for itself, are, theoretically, that the organic wastes present in sewage should be returned to the earth from whence they came, to be remoulded into vegetable life for future animal use. Science points unmistakably to the need of this economy, the neglect of which has heretofore impoverished large districts.

While science indicates that these organic wastes should be utilized to enrich the soil, it by no means follows that each and every locality should strive to this end. It may be that its accomplishment would cost more than its return money value, in which case the waste of these fertilizing elements, (when effected without endangering any sanitary principle), may be considered as so much expended to insure the public health. *Salus populi suprema lex.*

It must be borne in mind, however, that while we speak of the sewering of a district, the proper disposal of the rainfall on its surface, as well as the subsoil water, is no less important in a sanitary point of view. The surface water which scours the gutters and cleanses the streets of paved cities, except in the event of long-continued storms, is shown by analysis to differ in no essential from sewage, and requires equal facilities for its prompt removal. Stagnant water is the enemy of human life, and a water-logged soil is found to be one of the most potent causes of phthisis, as shown by the result of subsoil drainage in some English towns; hence the consideration of its proper disposal, as well as the removal of surface water and filth, cannot with safety be neglected when considering the sanitary needs of populous districts.

It will appear that there are *three* systems for the collection and removal of sewage from the neighborhood of dwellings. Each system comprises several methods:

First, the dry system. This divides itself into the general method, whereby the human fæces, without other liquid than that peculiar to the material itself, is alone dealt with. *Second*, the pneumatic system, where the house sewage alone is moved in hermetically-sealed iron

pipes to the outfall, by the method of a vacuum in the pipes or by compressed air, as the case may be. *Third*, the water-carriage system, where, by one method, the house sewage alone is conveyed to the outfall; and by another method, sewage of all kinds, from whatever source, including storm waters, are led to the outfall by the action of running water.

The methods under the first system comprise the midden-heap, privy vault, ash closet, dry earth closet and the equally barbarous or semi-barbarous method of pails, tubs, etc., or any plan, indeed by which the material is left for any length of time on the premises, and when removed is finally disposed of by hand or the horse and cart. The emptying of cesspools as ordinarily practiced, though not exactly a dry method, may yet be classed with the above.

Some of the methods of this system are still largely in use, even in large cities in Europe, and are not unknown in our own country, but are suitable only for isolated dwellings, farm-houses or small settlements, where the open air of the surroundings reduces the nuisance inseparable from their use, to a minimum. Removal by "pails" can scarcely be called a system, as not reducible to rules, but as one of the methods very much spoken of at present, it may possibly claim recognition as such.

The advocates of the pail method will urge its economy, and state in evidence its large and growing use in England, where the need of better sanitary conditions have forced themselves upon the attention of the authorities to a greater extent than elsewhere. In the towns of Rochdale, England, with a population of over seventy thousand, Manchester, with six hundred thousand, and Birmingham, with four hundred thousand, four-fifths of the people use the pail method, and it is on the increase in the crowded manufacturing districts of the north of England. The State Board of Health of New York, (second annual report, 1882,) have recommended its use for villages and towns without sewerage works, in our own country, as entirely inoffensive in its operation, and shows the economy of its use by stating "that the yearly expense of removing human sewage in Rochdale was but ten cents per head of the population," &c.

To this it might be answered that the recommendations of the New York State Board of Health, if carefully examined, will be found to be confined *exclusively* to such small settlements "as are without a public water supply or system of sewerage." But the citing of the method of Manchester, Rochdale and large cities among a wealthy, highly

refined and cultivated people, in such commendatory terms as "*inoffensive* and economical," and the urging its adoption as a sanitary measure has tended to fortify the belief in many minds that irrespective of the local circumstances which have forced the pail method into use elsewhere, (and which circumstances do not obtain in this country,) the fact of its use for many years in such crowded cities with satisfactory results, may be considered as evidence that it could not fail to be a desirable and safe method for *any* town or city in this country to adopt, whatever the character or extent of the population. Such views, though based upon an entire misapprehension, are prevailing to such an extent that in the interest of true sanitation I feel constrained to devote more space to a consideration of this pail method than at first sight, before this audience perhaps, would appear necessary.

In Manchester alone, with a population on both sides of the river of six hundred thousand, we are told there are no less than sixty thousand of these closets; in Birminghan nearly as many, three hundred thousand of the population in the latter city being furnished with them. They consist usually of a closet in the back of the premises, abutting upon, and accessible from a back alley, which alley serves for two rows of houses, one on either side. An iron pail of a capacity of about ten or twelve gallons is placed under the seat of the closet, provided with a cinder-sifter, through which the fine ash falls below, and the cinders into a recess, for further use in the household. The pails are removed by the town authorities at least weekly, and the pails emptied in extensive yards. The pails are cleansed and returned, and the excreta, together with refuse from slaughter-houses and other sources, and from the streets, are by mechanical and chemical expedients converted into manure, which under the most favorable circumstances costs considerably in excess of the sales; thus, at Rochdale, Mr. Thos. Hewsin, the engineer, reports as follows, for 1879: "The cost of the pail system with the disposal of the excreta in its crude state, is much more expensive than was the old privy system. The income from sales being no more, whilst the cost of collection will be from ten to twenty times as much."

The deep, large drains found near all the old Roman remains in England and on the continent, were built as conduits for drainage long before their use as sewers was thought of, and indeed it was penal in England before the year 1815 to cast human sewage into

them until a commission was appointed in England to inquire into the health of towns, the intolerable nuisance resulting from surface disposal of human excreta, was considered as the inevitable result of dense population growing out of the increase of great manufacturing interests crowded within limited areas.

Public attention was first called to the enormity of the nuisance then and there existing, by this Health of Towns Commission in 1844, less than forty years since, and in 1847 it was first made compulsory in London to use these drains for house sewage. It is difficult for us in this country, at this date, to realize the extent to which both the soil and the air were polluted, and the ravages of disease induced by the utter indifference to the exposure of human excreta in and around the residences, not only of the working and middle classes but of well-to-do residents as well. Decency will not permit more than a mere reference to the condition of things made public by the report of this commission; one or two extracts will suffice.

In Manchester the inspector reported in one locality in the city six hundred and forty-five houses, with a population of seven thousand and ninety-five persons, as having but thirty-three conveniences of any kind for the disposal of the house filth, and in another locality of the same city *three* or *four* entire streets were reported as without any accommodation whatever for that purpose, and in the report of the medical officers of the Privy Council, near twenty years later (1861), it was stated that in many cases in the centre of the towns no accommodation of any kind was provided.

We need not dwell upon the horrible condition of things which abounded in the crowded districts of England, nor wonder that as truer ideas of the dangers to health of this neglect began to prevail, residents in the districts should accept the pail system, operated, as was proposed, under strict official supervision, and at short intervals, (and notwithstanding what we should regard as, more or less, still a disgusting exhibition,) hail it as a most blessed improvement! It *is* unmistakably a vast improvement upon the reeking cesspools, open vaults and public manure-heaps, and the nameless abominations which previously abounded—a disgrace to civilization; but an intelligent native population have never tolerated these things, and if properly advised will reject the alternative which a lower grade of intelligence accepts with thanks. It cannot be denied, however, that we *have* a class of population very well disposed to revert to original habits, upon the principle probably of "persistency of type."

We naturally inquire why the existence of the larger underground drains should not have been availed of for the more ready disposal of this filth. To this it may be said that aside from the cost to the poorer classes, the use of the pail method, it was claimed, would keep out of the water-courses polluting elements which would otherwise render them unfit for domestic use, and at the same time give the agriculturists a more valuable manure, undiluted by water carriage, both of which purposes it very imperfectly performs. Setting aside the nuisance growing out of the careless misuse of this closet, the street filth washed by the rain, into the gutters, the baths, laundries and kitchen slops still require sewers for their disposal. Such sewers, where not previously existing, have been provided on a large scale even in towns where the use of the pail method was universal; and analysis shows that not only is the sewage therefrom equally polluting to the streams into which it is cast as is the discharge from water-closet towns, but that the bulk of the resulting sewage discharged from the sewers is in no essential lessened by the use of the pails. As to the sewage collected by the pail method the resulting manure has no such value as has been assigned to it, losing as it does so largely the chief fertilizing ingredient—the ammonia; for while the fæces, weight for weight, are more valuable than the urine, the value of the total amount of the latter is *six times* as much as the former, and the resulting ammonia is mainly lost in the preparation of the manure. A visiting engineer (Rawlinson) says of this manure at Rochdale, "I saw thousands of tons which the farmers would not take away." If this be true for the crowded areas and wasted lands of England, how much more in this country of unlimited virgin soil.

To show the emergency under which the pail method was advocated in England, the Irwill river basin (branch of the Mersey,) in which Manchester, Rochdale, Bolton, Bury, Oldham and other manufacturing towns are situated, has an area of three hundred and twelve square miles, and in 1871 a population of one and one-fourth millions, or near four thousand to the square mile, and increasing at the rate of two per cent. yearly, with eleven thousand and fifty factories of all kinds. The consequences have been that the streams are utterly unfit for domestic use, and notwithstanding the efforts to keep human sewage out of the streams, the waters are so polluted that the towns all seek their supply by means of storage reservoirs many miles off among the hills, and of very limited amount.

The Borough Engineers of England, in charge of sewage works,

formed an association some years since, whose proceedings are published from year to year, and from the papers contributed by engineers of prominence, members of the association, we can quote to almost any extent in entire condemnation of the pail method. Some of them, with a special experience of its working, can scarcely find terms sufficiently strong to express their disapprobation, amounting to *disgust*, of the pail method, even when operated under the best of circumstances; and the evidence is overwhelming that no community will tolerate the pail method if they could be *allowed* the water-closet, which in many places they are denied. In Manchester, with a public water supply, no houses below two hundred and fifty dollars rental are allowed the water-closet, and with varying rates of rental this is the principle established in the manufacturing cities in the north of England; a principle of classification is of questionable applicability in this country.

When, in 1880, Robert Rawlinson, Chief Inspector of the Local Government Board in England, was a royal commissioner to inquire into the sewerage and drainage of Dublin, great efforts having been made in that city to secure the adoption of the pail method by an official recognition of its advantages, after referring to Rochdale in Lancashire "as the locality where this method is best carried out, but at a yearly loss of £10,000 to the tax-payers," he concludes his report as follows:

"In our opinion, the cleanest and cheapest mode of removing excreta will be by water, through closets, drains and sewers to a common outlet. Houses must be drained, streets must be sewered so as to remove waste water, and if these drains and sewers are well and properly constructed *no additional expense need be incurred to transmit the entire volume of excreta from the houses and city*, if it is suspended in the waste water removed from the city through the drains and intercepting sewers to some outlet. The collection of the city excreta by means of movable pans or by the process of (so called) dry conservancy will cause more nuisance and be more costly than water carriage. The nuisance will be greater, because there will be retention of the excreta for a time on the premises, and the cost will be greater by the amount of labor necessary to collect the excreta, and also because there is no practicable mode of converting the excreta into a portable manure which will pay the incidental charges."

We trust enough has been said to show the fallacy of adopting the "pail method" of removing excreta in *cities* or populous districts in

this country, because local circumstances elsewhere may have rendered its adoption a preferable alternative. The characteristics of the locality should always govern the application of *any* system or method, however perfect in the abstract it might appear. The chief argument, that of economy or utilization, utterly fails as applied to our American cities.

EARTH CLOSETS, ETC.

The remaining methods of this system, such as the *ash closet* or the *dry earth closet*, require but a passing notice. The first, which consists in partially deodorizing the contents of the closet by ashes thrown into it whenever convenient, (but the contents not removed until the nuisance created compelled it,) was the intermediate stage between the dung-heap, open privy or midden, (so called,) and its successor, the pail or tub method. It was open to greater objection than the latter, as not admitting of official supervision to the same extent. The neglect of the lower classes to carry out any requirements essential to its inoffensiveness, if, indeed, any such there were, rendered the use of the ash closet offensive beyond expression. The resulting material was worthless for manufacturing into manure, and to cart it in its crude state direct to the land was attended by a cost, and other obvious objections, beyond its value.

The dry earth closet method might properly be as summarily despatched, but as illustrating the tendency of some individuals to seize on new methods of sanitation, and offer highly-wrought specious arguments in their support, unsustained by sufficiently extended experience, we cite the following as a warning to the ambitious sanitarian:

Some twelve or fourteen years since, a young American, now well known by his happy style of writing, adopted this dry earth closet from some English examples of its use, and endorsed it. I quote from his pamphlet, now before me, as follows: "I believe that these advantages, embracing the utilizating of a manure, *worth*, including kitchen and laundry waters, at least $10 per annum for each member of the family, old and young, and the removal of the most fertile source of typhoid fever and dysentery, and the prevention of cholera infection, together with the question of cost, will revolutionize the sewage question; and that public sewers will in future be restricted to the removal of liquid drainage alone." Testimonials, most emphatic and eulogistic in its favor, were obtained and published. The Earth Closet Co. was formed, local offices established, contracts for their

manufacture were entered into with the Colt Manufacturing Co., of Hartford, and agencies for their sale and introduction were established throughout the principal cities of the United States, as a preferable mode to that of the water carriage system for dealing with human excreta in cities, towns, &c.

Setting aside the enormous amount of fresh earth required, (a ton to an individual yearly,) even upon the assumption that it could be used over and over again without endangering health or comfort, and the consequent cost in cities, and the nuisance arising from improper use of the machine, not to say the danger to health thereby resulting, the manurial value of the earth after use proved no better than ordinary garden soil, and so far from a value of $10 per head. its use entailed a cost beyond any value which could be realized by its sale as manure, and it proved a total failure as an economical sanitary measure. It was suited only to isolated dwellings of a class where strict attention to its needs could be enforced, and we hear no more of it as a successful rival to water carriage. The details of this method need not detain us.

Second, a pneumatic system. The first method under this system is Lineur's, as applied in Amsterdam and some few localities in Holland, and is applicable to a dead-flat country, where sewage could not be moved by gravity. It is confined to the movement solely of the contents of water-closets, (without any flushing by water,) by means of their connection direct into iron pipes of small dimensions. A number of such pipes connect with a street main, which in its turn leads to a central reservoir, wherein, by means of the connection of the latter by a pipe with a grand central station, where a vacuum can be had by pump, the material, through the intervention of stops and valves, is sucked, as it were, to the station, where it must be removed by mechanical means, usually for manufacture into manure. Certain barometrical syphon traps between the house pipes and the street mains insure a uniform movement of the contents of closets whatever may be the amount of the material, whether much or little. The method has nothing to do with drainage of any kind, but is confined to the transport of human excreta alone, and is essentially limited in its range, and is attended, in first cost and maintenance, with an increased expense over simpler methods. The same is true of

Shone's method of the pneumatic system, which, in addition to the vacuum in the pipes, adds also a plenum process, by means of what are called "self-acting ejectors," operated by compressed air, supplied

by pumps at a central station, by which their contents are forced to the outfall. The advantages of Shone's method consists in lifting the sewage, at frequent intervals if needs be, to insure better grades in a flat country, or to overcome impediments, to a uniform grade, without thereby increasing the expense of motive power. This method is yet in the experimental stage in one or two towns in England, but has capabilities that it is thought may show to advantage in certain localities. The cost of the maintenance of this method under the severe frosts of our winters, will be a bar to its use on a large scale in northern localities; while elsewhere, the necessity of economy in first cost of works of sewerage will operate against its introduction. Its claim to a saving in the cost of excavation is of but little value, as this is but a small item in most localities. Neither method of the pneumatic system has as yet commended itself to our consideration by economical results attained, and in view of their increased cost we may safely await their more complete development under the fostering care of their designers.

We come now to the mixed system—that of water carriage—which divides itself into two methods, known as the "separate" and the "combined." Each has its merits, and each in the locality suited to its capabilities promises the best results attainable (so far as our present knowledge extends) by the modern system of sewerage. Then it only remains to determine which of these methods, combined or separate, best serves the need of the locality. As the question of sewering and draining a town refers generally to the selection of one of the two methods of this system or to their combination in the same locality, we shall examine them more in detail. The "separate" method, as its name implies, after receiving the house sewage in a pipe sewer (a line of small pipe for this purpose being laid on each side of the street) carries it by gravity to the outfall. The drainage of the yard and roof, as also the subsoil, are conveyed by a separate branch, either to the existing sewers under the centre of the street, or to a line of pipe laid purposely, but distinct from the pipes carrying the house sewage, the complete exclusion of rain water from the house sewage being considered as essential. The rainfall on the street is conveyed by open or covered gutters, connected at proper intervals with the main drain. Thus in a city, where drainage and the removal of the storm water are recognized as a desirable feature, no less than *five* lines of conduit are to be maintained in operation. This in connection with a flushing tank at the head of all the branch sewers, in order to a periodical cleansing of

the dead ends, which are without natural flow, constitutes the complete separate method. When in thinly-settled districts, or when from any cause it is not considered necessary to provide for the surface water on the street, this latter must find its way, after being collected in the gutters, to the drainage outfall of the district, or wait absorption by the soil or air, but the drainage of the roofs and paved yards, even in this case, must be provided for by a line of piping of some kind, and one for each side of the street, unless the streets are narrower than modern practice calls for, in which case a central line of pipe is made to answer the other needs. This method *separates* the sewerage entirely from the drainage of a town.

Some good examples of this method may be seen in some English towns, and it is frequently used in the suburbs of towns for limited areas. The most extended example of this method for an entire city, is shown in Memphis, Tenn., a city of some thirty-five thousand inhabitants, where, after the yellow fever epidemic of 1879, it was considered imperative to introduce some system of sewerage, and abolish the existing shallow privy vaults and cesspools, which rivaled, almost, in their extent and foulness, some foreign examples to which we have referred. These were considered to have contributed to the spread of the disease in that year, and it was but one of over a half dozen similar visitations in former years.

It is stated that the estimates for sewering the city by the combined method, that is to say, sewering and draining the entire territory tributary to the same outfall, was from $800,000 to over $2,000,000, but upon what basis we cannot say, as the smaller sum would have been a liberal estimate for the work required to be done. The estimate under the separate method for sewering alone, was but $225,000, neglecting any provision for surface draining. The funds of the citizens being inadequate to the larger outlay, they very properly, under the emergency upon them, adopted the separate method, which we are told has thus far proved entirely satisfactory. There has been no further outbreak of epidemic, but if the death rate is taken as an evidence of healthfulness, it has not realized the expectations of those who were interested in the work—a death rate as low as twenty per one thousand annually being estimated as the probable result of their labors, (see National Board of Health Bulletin Supplement No. 3, 1880,) whereas the death rate has scarcely been lower than double that amount, or near forty per one thousand (see Sanitarian for November, 1882), a high death rate for this country. The city of Brooklyn, for

the same time, shows but twenty-one per one thousand. With reference to the matter of cost, which will be examined further on, we would remark that notwithstanding the alleged economy in adopting the separate method of extremely small pipes, the expediency of doing so, in view of the complications which may arise in the future growth of towns, now say of ten or twelve thousand population, must be a question, and one which the local sanitarian must seriously consider before deciding in its favor. He must by no means permit his judgment to be influenced by the idea that this use of small pipes, confined to the conveyance of house sewage alone, is a modern invention. In reality it has been largely in use in suburbs in England and on the continent for the last thirty years, but is giving place to the combined method in populous districts, as the cheaper and more efficient. So far from its being "a new departure in engineering to maintain that a six-inch pipe with an inclination of $^1/_{150}$, was large enough to drain two hundred dwellings," as is stated in a late official document emanating from one of the engineers who was engaged in the Memphis sewer location, a very slight acquaintance with the literature of the subject will show that as long ago as 1852, at a time when the ordinary size of even house drains was two feet in width, and no sewer was built less than two or three feet in diameter, avowedly to enable workmen with spade and shovel to enter them as the only method of cleansing them, the general Board of Health reported to Parliament on this subject, wherein it was shown that a pipe of five-inch diameter, with an inclination of $^1/_{153}$, would suffice to drain the house sewage alone from twelve hundred houses.

The use of small pipes was then introduced, and though more efficient than the large brick drains previously in use, their advocacy was carried too far, as most innovations are, but it resulted in the almost universal introduction of small pipes in lieu of large brick sewers, and they now constitute the larger portion of every system of sewerage.

The *combined* method of the water carriage system consists, as we have seen, in simply providing one channel, and but one, for the discharge of the proportion of the storm water which is permitted to enter the basins placed at the street corners to receive it, together with the house sewage, and also the roof and yard water. As all water which enters the house leaves it as sewage, the measure of the latter is, in volume, the water supply. While this method is more costly to construct than is the separate, when the latter is

modified in its outlines to meet cases of emergency, or temporary expediency, as at Memphis, it is not more costly, when the two methods are compared in their entirety, and each developed to the extent of its capabilities, as claimed by their respective advocates.

The separate method has the advantage in this country of a godfather, whereas the "combined" method, being without protecting patents or fatherly interest of any kind from any one, can be cut and carved with impunity by any one calling himself an engineer. Any failures of absolute success in the method are very naturally attributed to the defect inherent in the system itself, whereas, imperfectly designed, it may be, in the first instance, it is very frequently built of inferior material and in disregard of true economy. Under the mismanagement peculiar to our changing city governments it is rather a wonder that the combined method has proved so rarely a failure. It is a *combined* method in more senses than one, as combining in many cases old and antiquated dimensions, as peculiar to the method, while they are not. As an instance, the Fleet street sewer, London, drained four thousand four hundred acres of city area; its outfall was twelve feet by eighteen, with a fall of one in four hundred and eighty. A modern combined sewer would fulfill its purpose in a circle of nine feet diameter.

We have seen that whatever may have been the personal uncleanliness of the common people in past times, and their disregard of ordinary decency in their disposal of domestic sewage, the danger of living on or near undrained land was fully recognized at all times, and the removal of surface water, not only in built-up cities, but even in the temporary camps of the period was dwelt upon by writers as old as the age of Augustus. The drains established for this pupose, some of them of extraordinary dimensions, became, in later days, the natural, even if unauthorized, receptacles for any refuse to be disposed of, including house sewage. What is, in many cases, now called the "combined method" of sewering, was not the result of original designs to that end, but within the days of some of us here, grew out of the application of old and existing works to a new purpose. Hence the failure of some of these hybrid structures when applied to more modern uses should not be taken as a standard by which to judge the system itself, when designed *ab initio* to serve the double purpose of surface drains and sewers, which is its function. Its growing use is an evidence that its double purpose is recognized as a sanitary need.

To properly examine the rival claims of the two methods would

consume much time and require extended illustrations in detail, and I am constrained to confine myself to a brief statement of the salient points of the two methods.

First. The separate method assumes that the removal of the house sewage alone is the first requisite, to which the drainage is secondary and comparatively unimportant.

To this it may be said that it is a common mistake to regard fæcal matter as containing the only foul elements in the composition of town sewage. That it is not even the preponderating source of such impurity is shown in the fact that, as we have previously stated, the chemical analysis of the discharge from the sewers of towns, where the water-closet discharge was *entirely excluded* from the sewers, differs in no essential, in its polluting elements, from the house sewage delivered by the small pipes of the town sewers entirely by the separate method, the collection of stable dung, amounting to one load daily for each quarter of a mile of Regent street, London. And sanitarians, in accordance with the belief which we have hinted at, as having obtained long centuries before any system of sewerage, as such, was thought of, agree in the danger to be feared from a damp soil, whether arising from undrained surface water or stagnant subsoil water, and regard the danger, though possibly less in degree, and less easily traced to its source, as no less *real*, and calling for equally efficient methods of removal.

Second. The sewers of the combined method, it is urged, are so largely in excess in point of area of section or capacity over those of the separate method, that the use of the former as conduits for the flow of the house sewage alone, or what may be called the dry-weather flow, is materially impaired, the depth of flow and consequent velocity being thereby sensibly diminished.

To this it may be said that with the flow reduced to the house sewage, in either case the same volume of liquid, will, in the smaller pipes of the separate system, (under the same inclination,) give a greater depth and velocity than it would have in the larger channels of the combined method, and so obstruction would be more likely to occur in the latter than in the former. But the difference in practice is much less marked than is commonly supposed, for in any modern example of the combined method a large percentage of the sewers are pipes, and in the branches, where the flow is limited in volume, pipes of small diameter, (differing but little, in their hydraulic radius, from the pipes of the separate method,) are invariably used. Thus in

Chicago, with three hundred and sixty-two miles of sewers, which are on the combined method, forty-four per cent., or one hundred and fifty-eight miles, are of vitrified pipes, and seventy per cent., or two hundred and fifty-two miles, are two feet or less in diameter; and in Brooklyn, of three hundred miles of sewers, eighty per cent., or two hundred and forty miles, are of pipes of eighteen inches or less in diameter. The obvious and inexpensive modes of clearing the sewers, either by temporary dams, city water supply, movable wagon tanks or other means of producing a temporary increase in velocity, above an obstruction, leave nothing to be desired on the score of efficiency or economy. The last year's report in Chicago shows the expense of preserving their entire system free of obstructions, to have been but one and eight-tenths cents per lineal foot. If the authorities are so disposed, the pipes of the combined method could be flushed *daily* by the flushing tank method, which is said to work so well in Memphis, and the combined flush from all the branches would give ample volume of water to sweep the main brick sewers.

Then there is the method of cleansing sewers by means of what is called a "pill," being a ball say two inches less in diameter than that of the sewer, which is put in at a manhole, and being driven along by the force of the water until an obstruction is met, when the ball becomes a dam, and the water escaping under and around the ball rapidly loosens up the material and sweeps it along the sewers followed by the ball. This method, according to Mr. Fowler, the engineer of New Haven, is completely satisfactory in that city, and the cost of preserving the entire system of sewers free of deposit is a little over one cent (1.08) per lineal foot yearly. Again, there is no difficulty whatever in furnishing a channel in the larger sewers which will concentrate the low flow into a section of precisely the same area and boundary as obtain in the pipes of the separate method. This is known as the *curette* or *cunette*, (either word is used,) and resembles the lower half of a pipe built into the brickwork, which, while furnishing no impediment to the storm water flow, concentrates the ordinary dry flow into a narrow channel. While its uses have been satisfactory the necessity for it has not been considered sufficient to justify even the slightly additional labor expended in its construction.

Third. The small sewers of the separate method are claimed to be more easily cleaned than the larger dimensions of the combined, by the process of flushing, which consists in the sudden application of a large volume of water with a velocity which sweeps away any obstacles.

It is scarcely credible to state the nature of the substances which no possible supervision is found adequate to keep out of the sewers. The fact must be recognized that nothing which can, by any device, get into them, and many things which it would be supposed were impossible, do find a lodgment at times in city sewers and form the nucleus of obstruction. As obstructions are found mostly on the branch sewers, from the limited amount of liquid there furnished, what are called flushing tanks are built at Memphis, holding each about a hundred gallons, at the end of all the branch sewers, which automatically empty themselves daily, and sometimes oftener, and passing into the small six-inch pipes fill the lower half and assist very materially the flow of the house sewage; and if need be, the city water supply may be readily turned into these tanks, thus tending to remove anything movable by water. If, instead of these small pipes, larger ones for rain had been built on the same grade, and with their bottom shaped like those of the small pipe, (cunette,) the same quantity of water, applied in the same manner, would produce a precisely similar effect. As the upper branches of the combined method are, as we have stated elsewhere, now universally of twelve-inch pipe, neither of the methods possesses any advantages one over the other in the ability to remove obstructions by flushing. Nor must the value of the rainfall be lost sight of in the combined method as a powerful means at times for sweeping away and thoroughly cleansing the entire system of pipes and sewers in a manner unapproachable by anything which the separate method has to offer.

Where the obstruction resists the flushing process, the combined method by its dimensions, offers great facilities of access, whereas, in the separate, (if built without manholes, as at Memphis,) the street must be ripped up and the sewer broken into.

Fourth. It is alleged that the large sewers generate and contain a greater quantity of noxious gas than do smaller ones, and are not so easily ventilated.

We know but little of the method of generation of the gases or vapors of sewers. It might be supposed that the greater area of the larger sewers would favor the generation of more gas, but it might be remembered also that the cubical contents of sewers increase faster than do their areas. The surface in a four-foot sewer is to be four times as great as is that of twelve inches diameter, but its area is sixteen times as great; from this we might infer that with any circulation of air in the sewer, the larger one would be nearer the condition of the

external air, and experience seems to confirm this fact. With respect, however, to the effect of this in dwellings, the quantity of gas in a sewer is of no consequence; it is the degree of concentration which is important. And in this respect large sewers have, it would appear, the advantage over smaller ones. Experience has not verified the claim that the smaller sewers are easier ventilated than the larger. With the main house drain untrapped, (and open to the roof,) as is entirely admissible in good workmanship, it would be easy to ventilate efficiently sewers of any size through the house pipes, since the combined area of the latter is many times greater than that of the sewer. But if it be considered more important that the house pipes be properly ventilated, as is the prevailing opinion, then with a water trap on the main drain it would be independent of the method which might prevail in the dimensions of the sewers themselves, whether small or great.

Fifth. The relative expense of the two methods is claimed as largely in favor of the separate method, as applicable to localities which would otherwise be debarred from the benefits of the water carriage system.

This to a certain extent is the fact, but it must be taken with some qualifications.

The first cost of a method of sewering, if confined to the bare purpose of removing the house sewage, will, if modified to suit exceptionable conditions, as we have previously stated, cost less than a method which at the same time aims to drain a portion of the storm waters from the streets, with the droppings of animals and other street refuse, together with all the water of back yards and roofs. That is to say, if a single pipe of six inches be laid in the centre of the street for the sewage of both sides (as at Memphis), otherwise, not.

The first twenty miles of the sewers laid in Memphis, it is said, cost $1.30 per foot, but at least thirty cents per foot were saved by omitting any manholes in the street, a saving as it has since appeared of questionable expediency, as we learn that it has since been found necessary to introduce them. Hence, an estimate of at least $1.50 per foot would be within the actual cost. There being very few cellars in Memphis, or structures below the level of the street, which ordinarily would be required, the drainage from the yards and roofs, which this method imperatively forbids, into the sewage pipes, must be otherwise provided for, and could not be had at less than $1 per foot. This makes the separate method without any street drainage whatever, to cost at least $2.50 per foot, or one-sixth less than the cost of the

combined method in Chicago, which was $3 per foot, including fixtures and every attendant expense, the sizes of sewers ranging from one foot in diameter to nine feet. The extension in Chicago the last year shows the cost of twelve-inch pipe as $1.14 per foot, the fifteen-inch, $1.33 per foot, the eighteen-inch, $1.88 and the two-foot, $2.08 per foot. These three sizes would probably be ordinarily used in a separate method but with a larger proportion of small pipe.

The cause for no greater saving being shown in the separate method grows out of the fact that there are many items of cost in sewer construction which do not decrease with the size of the pipe used, such as superintendent, office expenses, sheeting, trench excavation, pumping from foundations, repairs to roadway, &c., and as the cost of excavation increases owing to quicksand or other material difficult to manage, this disproportion in price may become insignificant. Thus sewering alone might prove as expensive in first cost by the separate method as would sewering and draining by the combined, and in addition, the maintenance of the separate method would be more costly than the combined in a northern climate.

Sixth. Rain water in excess is claimed by the advocates of the separate method to be seldom more than inconvenient, and at most places can properly be allowed to flow off over the surface of the ground as it did before the introduction of sewers.

While we considert his argument to have been met by hinting at the well-known injurious effects of stagnant water upon human health and life, we can add that precisely the same sort of reasoning would apply to the sewage itself before the introduction of sewerage works.

Seventh. Where it is absolutely necessary to remove rain water, as well as sewage, by underground conduits, it still may be effected more efficiently, it is claimed, by having separate channels of discharge, and a superior efficiency had by a slightly increased cost.

To effect precisely the same purpose as the combined method, the separate will cost nearly one-half more, and their superior efficiency is not apparent, while there are many objections in the maintenance of so many lines in working order. The liability of misuse of the several pipes by wrong connections designedly effected to save cost, has often taken place in England and would be still more likely to occur here. As to maintaining that nothing can get into these small pipes which they are unable to discharge, the fact remains that they do become choked through ignorance or carelessness, to an extent sufficient to give constant employment to special workmen.

Eighth. Increased facility is claimed for the separate method where pumping, or a treatment of the crude sewage for manufacture of manure becomes necessary.

Where cellars are of necessity below the level of the street sewers, and pumping must be resorted to in order to drain them; the less the volume to be pumped the cheaper will be the process, without doubt. But as to the further utilization of the sewage, it is to be presumed that the capacity for rain water, which the large conduits of the combined method possess, need not be availed of throughout their entire extent, as by a system of penstocks and storm overflows heavy storms may be diverted to the water-courses, and little more than the ordinary flow of the town sewers at such times need be led to the manufacturing works to be dealt with for manure.

I have thus briefly sketched the salient points of the two methods of the water carriage system, with the claims made by the advocates of the separate method for universal applicability, and the counter arguments in support of the combined method. It could be wished that a more complete analysis of the respective methods had been presented. But the subject more in detail has been well treated by Mr. Elliot C. Clarke, engineer of the Boston sewer department, in the second annual report of the Massachusetts State Board of Health, Lunacy and Charity, Supplement, 1880. to which I would respectfully refer you as a most exhaustive article on the water carriage system, which shows very satisfactorily, as I think, the benefits to be derived from the combined method for populous districts, with the exception, however, that he allows a greater dimension and consequent cost for storm water sewers, than modern practice would probably call for. Justice requires me to add, that to this paper of Mr. Clarke's a reply has been made by Col. Geo. E. Waring, who projected the Memphis sewer system, and published in the March and April Nos. of the American Architect for 1882. For the rest, permit me to call your attention to the report of Mr. Rudolph Hering (who occupies the first rank as a sanitary engineer in this country), made to, and published by the National Board of Health, December, 1881, Bulletin, Supplement No. 16, wherein after a clear and concise review of the works of sewerage in European cities, he so illustrates the working of each as to enable us to sum up the conditions under which each of the methods which we have considered of the water carriage system, is properly applicable; and they may be condensed as follows:

The *combined* is suitable—

First. When rain water must be carried off underground from extensive districts, especially when they are closely built up as in large cities, and where new sewers must be built for this purpose.

Second. Where purification is not required, or is not difficult, and storm water overflows are not objectionable in polluting the streams.

Third. When a sufficient amount of water or sewage is available for flushing the larger sewers.

The *separate* method is suitable—

First. Where rain water does not require extensive underground removal, and can be concentrated in a few channels slightly below the surface, or where it can safely be made to flow off entirely on the surface. Such conditions are found in rural districts where the population is scattered, or small, or at least in short drainage areas, and on steep slopes or side hills.

Second. Where an existing system of old sewers which cannot be made available for the proper conveyance of sewage can yet be used for storm water removal.

Third. Where purification is expensive, and where the river or creek is so small that even diluted sewage from storm water overflows would become objectionable, especially when the water is to be used for domestic purposes at no great distance below the town.

Fourth. Where pumping the sewage is found too expensive to admit of the increased quantity from intercepting sewers during rains, which can occur in very low and flat districts.

Fifth. Where it is necessary to build a system of sewers for house drainage with the least possible cost and delay, and the underground rain water removal, if at all necessary, can be postponed.

In selecting a system or method, in addition to the first cost, there must arise the usually embarrassing question, Where shall the outfall of the public sewers be located? In answering this question neighboring towns as well as individuals must be consulted, or an item for damages might otherwise arise. This question of the disposal of sewage, in which health and comfort are balanced against cost, is before many of our towns to-day. When we recollect that there are some six hundred towns in our country provided with public water supply, and at least *four*-fifths of them as yet without any system of sewerage or drainage, it will be seen that the final disposal of town sewage, in a manner, so as to avoid the pollution of the water-courses or sources from whence the domestic water supply is derived, is becoming a matter for grave consideration on the part of sani-

tarians. The vexed "sewage question" we have read and heard much of, while its solution was of but general interest, but the rapid improvements in our own country are bringing it home to our doors as a question of individual as of national importance. We thus need to consider

The treatment of sewage called utilization.

Before examining this, we would remark that the average amount of human excreta may be stated as 120 gallons, or 16 cubic feet yearly —.044 cubic feet daily, and estimated to weigh 2.8 pounds. If the water supply be 20 gallons per head—2.66 cubic feet daily—this is sixty times the bulk of the human sewage, or combined, may be stated as 2.7 cubic feet. The excreta alone from an individual has been variously estimated, as in a manurial point of view, worth from $1.25 to $2.60 yearly of the population. As the water which enters a house leaves it as sewage, our greater water supply, (as well as rainfall,) renders our domestic sewage in bulk about one-half as valuable as that of English towns, six-sevenths of which is in solution, or about one cent per ton, (Seventh Annual Report Mass. State Board of Health, 1876.) It is estimated that it takes two thousand four hundred tons to equal analytically one ton of guano.

Where sewage can be cast into the sea or tidal river without the danger of returning upon the shores, or attended with any other unsanitary condition, experience fully indicates that this is the best possible disposal of it; though simple as it appears, it is sometimes attended with difficulties, which add very greatly to the expense. But no presumed theoretical value in the elements which go to form sewage should induce a town or city thus circumstanced to attempt as a commercial undertaking its utilization, either by putting it crude upon farm lands in the neighborhood, or manufacturing it into dry manure for transportation. But where the district is situated upon inland waters, and the summer or low flow of the stream is less daily than twenty times the daily volume of the sewage, the latter estimated as not less than the artificial water supply during the same interval, or where periodical impediments exist to the uninterrupted flow of the stream into which the sewage is cast, such as dams, ponds, &c., and the sewage is retained for a time on its shores to breed pestilence; or when the district is wholly inland without living streams of any magnitude in its vicinity, the ultimate disposal of the sewage without endangering the health of the people, becomes a matter of grave consideration. Some process must be resorted to by which it

may be rendered harmless, called utilization, not in hopes of a profit to the town, but to be effected at the least possible additional expense to the tax-payers. This is the best result to be hoped for, (in our present knowledge of the subject,) and to this end several methods are in use.

These methods are precipitation, irrigation and filtration.

Precipitation. This consists in receiving the crude sewage at the outfall into tanks, and by adding some chemical ingredients, the solids held in suspension are precipitated, and the effluent liquid, more or less clarified and deodorized, is allowed to escape into the streams. What is called the "sludge," of the consistency of thick mud, remaining at the bottom of the tanks, is raised by various methods, and either by the application of heat or machinery is dried and disposed of as manure, but is ordinarily not so valuable as to command any ready sale. This sludge sometimes accumulates in such quantities as to necessitate the purchase of land with a view to its *burial.* In Birmingham, with a discharge from the town of twelve million gallons of sewage daily, and the use of thirteen tons of lime, the daily amount of sludge on their hands is not less than four hundred tons. Neither is the effluent water in all cases more than clarified, without being purified, and soon becomes more or less offensive. Under favorable conditions as to subsequent dilution in running streams, the process has in individual cases been moderately successful in a sanitary point of view, and at no great cost. The hope thus held out of final success, has resulted in innumerable patents being taken out for treatment of sewage by precipitation, among which the following may be named:

The A. B. C. process, so called from the initials of the ingredients used in the precipitation, alum, blood and clay; the phosphate sewage process consists in the use of alumina and lime; Bird's process uses what is called sulphated clay; Stethart's process, lime, sulphate of alumina, sulphate of zinc and charcoal; Hille's process, lime, tar and salts of magnesium; Marsdens & Collin's process, lime, carbon from the manufacture of prussiate of potash, ashes, soda and perchloride of iron; Holden's process, lime, sulphate of iron and coal dust used under certain modifications, in deodorizing the sewage of one of our extensive summer hotels on the coast of Long Island; Fulda's process, of lime and suphate of soda; Blythe's process, superphosphate of lime with magnesia and lime; Whitehead's process, dicalcic and monocalcic phosphate and milk of lime; Campbell's

process, phosphate of lime and lime added; Hansen's process, lime, black ash and red hematite, treated with sulphuric acid; Goodall's process, lime, animal charcoal, ashes and sesqui-persulphate of iron. The lime process alone has been in use forty years or more. It offers economy in first cost, but it cannot be considered as successful, the resulting sludge accumulating in such quantities for lack of a demand by the farmers that its disposal adds much to the expense. Scott's process, by which this sludge is manufactured into cement, is well spoken of; other processes, such as Higgs', Dale's, Demsdale, Leuk, all *promise* success enough on a small scale, to encourage the patentees, but invariably, when extended, have resulted alike in failure. All these precipitation processes do, to a certain extent, purify the sewage or clarify it, chiefly by removing the suspended matter from the sewage; but they all leave a very large amount of putrescible matter in the effluent water. At least all the ammonia contained in the sewage is carried off in the effluent fluid, and sometimes the quantity is increased. The resulting manure that they produce from the sludge is in every case very inferior, as the valuable constituent of sewage consists mainly in the ammonia, which is lost to the solid manure, showing the futility of the attempts to utilize sewage by precipitation alone.

Irrigation. This, it is stated, has produced good results. In Edinburgh, some two hundred years since, the simple process of irrigating the meadows of Craigentinny by crude sewage was undertaken. It still continues there after a long interval during which it was disused, without much change in the process, and with no more favorable results to the city treasury.

The average results from a large number of towns show that owing to the necessity of leaving the land to recover itself after being drenched with sewage, (but the flow of sewage meanwhile being unintermittent,) some three hundred and sixty acres are needed for every million of gallons daily of sewage. The cost of the operation is largely increased by the high value of land in England, and hence, scarcely a guide for us on the score of expense. The process now consists in preparing the land by disposing the surface at short intervals into ridges and furrows, with such precautions as regards levels that the sewage being led by the main conduit and branches (sometimes open trenches,) over the surface, will nourish the roots of the plants, then drain off to the outfall discharging into some stream. Even dry sand beaches have returned good crops by this treatment; and though bad smells

are reported as rife, thus far it does not appear to be attended with any danger to health. Below Paris, at Gennevilliers, where the irrigation by means of some ten or twelve million gallons of Paris sewage daily over some twelve hundred acres is now carried on, a village, according to Mr. Hering's report, has sprung up in the midst of the irrigation field, the death rate showing as low as 19.5 per one thousand of the population. Additional land is being taken in yearly and the works extending, not without remonstrance, however, from residents in the neighborhood, who declare it a nuisance every way.

Filtration alone has in all cases been abandoned, but more recently what is known as *intermittent downward filtration* is claiming attention, which consists in preparing the ground, which in the first place must be of suitable character and favorably situated, by deep underdraining, say not *less* than six feet, and passing the sewage both over and *through* the land intermittently, that is, allowing certain areas time to aërate and recover themselves before a renewal of the operation. The claim is that by this process a much less extent of ground, say twenty to twenty-five acres per million gallons of sewage daily, will suffice for purifying the sewage. The precise benefit over the method of broad irrigation is not yet determined, and except under favorable circumstances its advantage over the other has been seriously questioned. It has been proposed to use this method in connection with broad irrigation.

The value of these several processes is reported upon by "the Executive Committee of the Society of Arts [England,] conference," as follows:

"With regard to the various processes based upon subsidences, precipitation or filtration, it is evident that by some of them a sufficiently purified effluent can be produced for discharges without injurious result, into water-courses and rivers of sufficient magnitude for its considerable dilution; and that for many towns, where land is not readily obtainable at a moderate price, these particular processes afford the most suitable means of disposing of water-carried sewage. It appears further that the sludge, in a manurial point of view, is of low and uncertain commercial value; that the cost of its conversion into a soluble manure will preclude the attainment of any adequate return on the outlay and working expenses connected therewith, and that means must therefore be used for getting rid of it without reference to possible profit," and further: "In certain localities where land at a reasona-

ble price can be procured, with favorable gradients, with soil of a suitable quality and in sufficient quantity, a sewage farm, if properly conducted, is apparently the best method of disposing of water carriage sewage. It is essential, however, to bear in mind that *a profit should not be looked for by the locality establishing the sewage farm, and only a very moderate one to the farmer*."

In addition to the above method of sewage disposal, we may add a word as to the effect of casting it into the sea; regarding this as an obvious method on the long eastern coast of this state, but one which may ultimately prove embarrassing to some of the fashionable resorts there growing up, unless the proprietors are willing to put their hands into their pockets and pay for the cleanliness that is akin to godliness. This coast, open to the full sweep of winds from the ocean, and the absence, save in a restricted sense, of any literal off-shore current, will render the final disposal of crude sewage a matter of some difficulty, as being sure of being thrown back upon the shore. With the open sea before them, and apparently exempt from the consideration of sewage as requiring purification before throwing it away, the evidence of this necessity will be likely to be received with great unwillingness at first. Yet it may be considered *certain* that this evidence of the necessity of such a measure will accumulate to such an extent that some means for the classification of the sewage, at least to the degree of rendering its subsequent dilution by sea water a sufficiently sanitary measure, will undoubtedly prevail earlier or later. Some form of precipitation will be resorted to, the effluent water temporarily deodorized, but undoubtedly putrescible, being discharged periodically at a distance from the shore and at certain states of the tide, and the sludge removed by boats, or otherwise disposed of as it best may be.

The same or similar methods may be resorted to on rivers whose waters serve at the same time for domestic use further down stream: but the process of purification must be carried further than that indicated above, to the extent of purifying and deodorizing the effluent water before discharging it into the river; this may be effected by some of the processes of irrigation or intermittent downward filtration, which have been shown to be efficient to that end in a sanitary point of view, *but at a cost*. This cost is dependent upon the circumstances of the case, and we have as yet in this country too little experience of our own to determine beforehand. We may confidently expect, however, that the volume of our rivers, our less crowded

areas, the consequent reduced value of land for sewage farms, the comparative freedom from fogs, and long-continued dampness of atmosphere, retarding evaporation, and the greater prevalence of bright sunshine, all the favorable attendant circumstances, indeed, except the one of greater severity in our winter climate, are calculated to reduce the expense attendant upon the final disposal of sewage from our inland towns, in comparison with the experience in England; the average cost there, by irrigation, being stated at about $39 for every million of gallons of sewage treated daily, that is, over and above any receipts for sale of manure or the sale of resulting crops.

Brooklyn, December, 1882.

THE DISPOSAL OF TOWN SEWAGE.

BY PROF. CHARLES McMILLAN, C. E., PRINCETON.

Projects for the disposal of sewage belong to one of two general classes, viz.:

First. Schemes for wasting the sewage, and

Second. Schemes for purifying it and utilizing its fertilizing ingredients, in whole or in part.

It is to the former class that your attention is particularly invited. Schemes for wasting sewage, especially when executed on a large scale and under suitable conditions, are, unquestionably, the least expensive. They are usually adopted because of the nearness of a very large body of moving water, which may serve at once as a diluent of the foul matters discharged into it, and as a natural vehicle for their speedy removal beyond the limits of the town or other settlement where they originate. The easy access to such a body of water is, of course, an essential condition for the successful prosecution of such a scheme.

Towns thus situated are particularly fortunate in having at hand so inexpensive a mode of getting rid of their wastes; and even small settlements, if not too straggling, may find it profitable to consider whether systematic sewerage, under such circumstances, would not be more satisfactory, in every way, than the usual expedients adopted in such places. But, on the other hand, it should be remembered that while the pecuniary advantages of wasting sewage into streams are often very great, a corresponding degree of caution must be observed in resorting to this mode of sewage disposal, and proper attention should be given to the sanitary questions which are involved, whose satisfactory solution should, in every case, precede the adoption of such a scheme. These questions relate to the degree of pollution which the sewage will produce in the stream, especially during periods of low

water, and to the consequent possible invasion of the rights of communities or individuals dwelling below the points of sewage discharge.

It must be acknowledged, however, that this general inquiry does not usually admit of a satisfactory answer. The degree to which it is safe to pollute fresh-water streams is as yet little understood. Neither our own practice nor the experience of European engineers, nor yet the important work already accomplished by the Rivers Pollution Commissions of Great Britain throws sufficient light on the subject to raise it above a tentative level. This should not be a cause of surprise when the intricacy of the problem is considered, the variableness of its elements, and the meagreness of our information regarding those very facts which would naturally constitute the known or given quantities of such investigations. Some eminent authorities, after inquiries conducted under circumstances especially favorable as regards the means and talent at command, have declared it to be their opinion that water that has been once contaminated by sewage or manure matter is henceforth unsuitable for domestic use. Many practitioners, however, while acknowledging the great danger lying in the presence of even very minute quantities of *crude sewage* in potable water, lay more stress than the authorities whose opinion has been quoted on the self-purification of streams, especially through the destructive agency of free oxygen and of aquatic plants, and are therefore disposed to regard the above sweeping condemnation of sewage-tainted waters as too broad an inference from a limited range of observations.

It is true that a scheme for discharging sewage into a river whose volume, even at low stages, is vastly in excess of that of the impure liquid that it receives, is not burdened with much perplexity.

But such cases, as we all know, are the exceptions. Their freedom from complications of a sanitary nature, so far as sewage disposal is concerned, usually renders them, in that one feature, neither objects of concern to sanitarians nor, I may add, the most fruitful sources of the incentives to an active investigation of the important questions relating to the conservancy of streams. It is generally the smaller streams of the more densely populated portions of a country which, when made the receptacles of filth, compel attention to the necessity of greater cleanliness in this respect, through their assaults on the senses and on human interests to the extent even of affecting life itself.

It is unnecessary to enter into an enumeration of the reasons for the protection of fresh-water streams from pollution. They are so generally recognized as to need no repetition here. The time which

might thus be occupied will, therefore, be devoted to the more important purpose of endeavoring to reach a proper understanding as to the manner in which the expediency of temporarily using any stream as a receptacle for sewage may be approximately determined. I say *temporarily*, because an increase of population must sooner or later disturb the basis on which every such project is founded and necessitate, in some measure, the diversion of the sewage to filter beds or other means of purification as a preliminary to admitting the sewage effluents to natural watercourses.

The British enactments for preventing the pollution of rivers prohibit the discharge into streams of all sewage that has not previously been raised to a given degree of purity. The standard required by them is an arbitrary one, and is applied to all fresh-water streams alike, without regard to their natural purity, size or any other varying conditions. Moreover, a strict compliance with the requirements "appears to be construed into its being necessary to deal with the sewage on land, so that those towns which are so situated as to be unable to dispose of their sewage on land have no means of attaining certificates that they were dealing with their sewage efficiently."* These reasons and others, prominent among which is the friction caused by a failure to apply the law uniformly and simultaneously to all the settlements of a given drainage district instead of to isolated towns, seem to have caused the decree of the Rivers Pollution Commission, especially in their earlier applications, to fall short of securing even a moderate share of the advantages which were expected from their promulgation.

Some of the difficulties are set forth by Dr. Wallace in a lecture before the town authorities of Glasgow. He says: "In the case of a number of towns, such as Birmingham, Bradford and Leeds, the purified sewage is incomparably purer than the grossly-polluted streams into which it flows. These and many other towns are subjected to the manifest injustice of being compelled, under heavy penalties, to render their sewage clear, inodorous and almost perfectly colorless before discharging it into rivers or streams, which are often, as in the case of the Bradford Beck, literally common sewers of the foulest description. The inhabitants of these towns complain, and with good reason, that in the upper reaches of the rivers wholesale pollution is permitted, while they have been put to great expense in order to accom-

* "Sewage Disposal," by Henry Robinson, C. E., London, 1880.

plish a purification, the effects of which are swallowed up in the filth of other towns over which they have no control." This was uttered only three years ago.

Now, while I have no kind of doubt that the strict rule adopted by the English will ultimately be found, from a sanitary point of view, to have been a great blessing to the entire kingdom; and while it may be, although I am inclined to doubt it, that uniformity of standard is calculated to furnish sanitary authorities with the most practical basis of control of these matters in a country whose population is as dense as that of England, and many of whose rivers have been so long and so greatly befouled, I cannot help viewing the total exclusion of crude sewage from the streams of Great Britain by the proposed enforcement, under every variety of circumstances, of a fixed and high standard of purity for sewage effluents, as a somewhat hasty and oppressive expedient for accomplishing a beneficent end. The opinions of those who have recommended this measure are very properly esteemed of great weight, and yet it may be fairly questioned whether a plan quite as efficient and less burdensome to the public than that adopted might not have been reached by endeavoring to provide for a more gradual restoration of the purity of the streams, by beginning the cleansing process near the sources of the streams instead of at points nearer tide water, and by solving each case of pollution by the sewage of a settlement in the light of its particular surroundings, and its bearings on the welfare of lower neighborhoods, instead of regulating all cases by a fixed rule and standard. The framers of the Rivers Pollution Prevention Act of 1876, seem to have realized the hardships with which the total exclusion of crude sewage from streams would bear on communities already provided with extensive sewer systems delivering into streams, and have drawn a very marked distinction between old works and new ones, and in favor of the former, by a clause which, singularly enough, as Mr. Robinson says, has caused the act to be practically inoperative.

But even should the present mode of dealing with this question in England be admitted to be the best for that country, it does not necessarily follow that it is equally as suitable for others. The limited area of England, the denseness of her population and the long neglect of her rivers, which has made some of them literally open sewers, are, unquestionably, the important causes that have made the conservancy of British streams a vital question. And it may be that the accumulated evils arising from these causes call for immediate and

heroic remedies. But in a larger country less densely inhabited than England, and possessing a different climate, the conservancy of its streams may readily become, under such different conditions, a problem of much less gravity, wherein considerations of economy might be allowed a reasonable weight without endangering human life, and whose solution, therefore, would admit of a more liberal and comprehensive treatment with regard to *all* the interests involved.

In our own country all the conditions are so very different from those existing in England that the purity of our streams has not yet become, except in a few localities, a matter of great concern. It is, nevertheless, a very important and a growing question, which year by year, as one stream after another becomes tainted, will force itself more pressingly on our attention. There is no escape from it. And it were therefore wise in our authorities to institute, through the agency of properly constituted commissions, early and systematic inquiries into the whole subject, with the view of being prepared to regulate the admission of impurities into streams. It is believed that the conclusions from such inquiries in this country will differ very materially from those reached by the British commissioners, especially in regard to the necessity in the immediate future of excluding crude sewage from streams.

But now the question may be asked, How is a reasonable degree of purity to be maintained in our streams if the exclusion of crude sewage from them is not to be regarded, as it is in England, as the very key to the solution of the problem? The answer is: By regulating the discharge of crude sewage, in every case, to suit the capacity of the receiving stream in such wise as not to raise the impurity of the latter, at a stated distance below the outfalls of the sewers, beyond a limit to be determined by the nearness of settlements, by the natural condition of the stream and its powers of self-purification. It is believed that a careful observance of this rule will in almost every case lead to a practical and not unfair solution of the question. Thus, it may be found that in one case it is unsafe to cast any crude sewage into the stream, and therefore that resort must be had to cleansing processes; in another, that a partial delivery of crude sewage is admissible; or, as in the case of our large rivers, that it is perfectly expedient for a considerable period of time to resort to the stream for sewage disposal. However, the investigation of any particular case should be a guarded one, for reasons given further on; and it should also be remembered that the tendency to practice economy at the

expense of our neighbors operates, unfortunately, with especial force in problems of this kind, and that the menace to other neighborhoods arising from a selfish economy or from errors of judgment, may be a very grave one.

On the other hand, I believe that while such investigations need not and cannot be pressed to the point of absolute certainty, they will have been conscientiously carried out when the possibility of injuriously defiling the waters used by neighboring settlements shall have been reduced to a very remote contingency.

The rule which I have advanced is based on the assumed power of self-purification of running water. We have, unfortunately, but little specific information on this point, but that which has been gathered indicates, unmistakably, that all streams have, in a greater or lesser degree, the power of converting organic impurities into harmless compounds. The Rivers Pollution Commission gives a *résumé* of their observations on the point in question in their report of 1874, the practical deduction from which is that, while the destruction of organic matter does go on in sewage-laden streams, the process is nevertheless a very slow one. Their observations of this phenomenon in natural streams are not recorded in a form which would be available for use in this paper; but the general conclusion from a laboratory experiment of the commission * is that, at a mean temperature of 68° Fahr., a given volume of sewage diluted with twenty times its bulk of fresh water would lose at the utmost about two-thirds of its organic impurities in a run of one hundred and sixty-eight miles at the rate of one mile per hour, or in about a week. These experiments have been deemed important because they were purposely restricted to a given mixture of sewage and clean water, in order to remove all uncertainty from the "variability of the composition of the river waters at different times of the day," and also because of their results which have been so widely quoted. The agitation of the mixture while conducting the test was more favorable to its thorough aeration than that which would usually arise from the natural movement of streams;

* "Water and Water Supply," by Professor W. H. Carfield—Van Nostrand's Science Series, 1875.

A mixture of London sewage and clean water having, after mixing, .267 parts of organic carbon and .081 of organic nitrogen in one hundred thousand parts of the mixture, was thoroughly exposed to the atmosphere and agitated by being syphoned from one vessel to another, falling each time through three feet of air. At the end of ninety-six hours the mixture was found to contain .250 parts of organic carbon and .058 of organic nitrogen; and after one hundred and ninety-two hours, .2 of organic carbon and .054 of organic nitrogen.

and this advantage may possibly have compensated for the lack of any cleansing agency akin to that of aquatic plants, which are believed to play no inconsiderable part in the destruction of the organic constituents of water. Whether there was any such compensation is very uncertain and, therefore, in deducing a general inference from the experiments, our conclusions may be somewhat in error from being based solely on the effects of the reducing agencies employed, viz., the free oxygen held in solution by the water and the atmosphere.

The thoroughness and rate of oxidation of a given quantity of organic matter in liquid form will very probably be in a direct proportion to the volume of fresh water used for its dilution; that is to say, if the amount of fresh water be doubled, the rate of cleansing a given bulk of sewage will probably be twice as great as it was before, and so on.

It is natural to suppose that the oxidation of the sewage will progress more rapidly as the time of its exposure to the effects of the clean water increases, for, the amount of organic matter will be constantly diminishing while the volume of the stream remains constant, and its store of free oxygen is all the time being replenished from the atmosphere. A theoretical consideration of the actual conditions seems to indicate that the average rate of oxidation, in different times, varies according to a law which is rather too unwieldy for use in a computation which is only after all a rough approximation. I have, therefore, assumed the rate to vary in the simpler ratio of the squares of the times. This will lead to some error, but inasmuch as our computation will have to progress from small degrees of dilution to higher ones, the errors will be on the safe side, as they should be.

The results are shown in the first two columns of the following table. The third column will be explained further on. (See page 108.)

TABLE NO. 1.

Degree of dilution of sewage.	Times required for cleansing.	
1 part of sewage to 30 parts of water.	168 hours.	[168]
1 " " 40 " "	145 "	[139]
1 " " 50 " "	130 "	[119]
1 " " 100 " "	92 "	[75]
1 " " 200 " "	65 "	[48]
1 " " 300 " "	53 "	[36]
1 " " 400 " "	46 "	[30]
1 " " 500 " "	41 "	[26]
1 " " 1000 " "	29 "	[16]

If this table is at all a fair inference from the data referred to, it would indicate that a stream flowing at the rate of one mile per hour, which received $^1/_{1000}$ part of its own volume of sewage, would have to run twenty-nine miles before it would regain its normal purity.

An example bearing on the same point is derived from the condition of the Seine below Paris. The total discharge of the sewers of that city is about one hundred cubic feet per second. About one-sixth of this is diverted to the sewage farm at Gennevilliers, leaving about eighty-three cubic feet per second to be discharged into the river. The volume of the river is reported by D'Aubuisson as being about four thousand six hundred cubic feet per second; hence the sewage is diluted with about fifty-five times its own bulk. Now at a point about fifty miles below Paris the river is stated to be perfectly clear and in a normal state of purity, or, to use the words of my authority, chemically pure. If this be true—and there seems to be no reason to doubt it—it would seem that for a dilution of fifty-five, or, inverting the terms, for a degree of pollution of $^1/_{55}$, a thorough cleansing is accomplished in a run of about fifty miles at the rate of a little over two miles an hour, or in about twenty-five hours.

Using these data as we did those of the experiment already considered we have the following table:

Table No. 2.

Degree of dilution of sewage.	Cleansing run at the rate of two miles per hour.	Time required for cleansing.
1.30	68 miles.	34 hours.
1.40	59 "	29½ "
1.50	52 "	26 "
1.100	37 "	18½ "
1.200	26 "	13 "
1.300	22 "	11 "
1.400	18½ "	9¼ "
1.500	16½ "	8¼ "
1.1000	12 "	6 "

A particular feature in the case of the Seine, which very probably contributes considerably to the purification of that river, is that both the banks and bottom of the middle ground of the polluted reach of the stream are occupied by a very luxuriant vegetation. Now, when the efficacy of aquatic plants in preserving the purity of water in

aquaria is remembered, it should not be surprising to find a marked difference in the results of the two cases quoted; although we would scarcely be prepared to look for so great a divergence as that indicated by corresponding numbers in the tables.

The contrast between these tables and between the data on which they are based illustrates very strikingly the extremest variation of results which may arise from a difference of circumstances in problems of this kind.

In the absence of other information this contrast would be very discouraging were we not in some degree warranted in viewing the case of the Seine as illustrative, in a general way, of the self-purifying power of rivers, and possibly also, (with a large allowance, however,) of average streams in the alluvial districts of warm countries, while the experiment referred to might be taken as an extreme indication of what might transpire in the case of a polluted brook flowing through rocky defiles and uncleansed by any other than atmospheric agency, or in the case of rivers in the northernmost portions of our land. In either case, however, the tabular conclusions presented before you must be accepted with great caution, perhaps with considerable dilution, especially where they exhibit the probable times of cleansing waters which are but very slightly debased by organic impurities, for—Firstly, variations of temperature have a marked influence in accelerating or retarding the distruction of organic matter. In what degree this occurs it is impossible, in the light of our present knowledge, to say. Secondly, sewage, as usually delivered, requires a run ranging, in ordinary cases, from a few hundred yards to a mile or two before becoming well mixed with the stream which carries it. This distance is of great importance when we are considering short runs, and an allowance must be made for it in each case, depending on the location of the outfall and the width and degree of disturbance of the stream. The most practical way of applying this correction would be to make the extreme allowance for every ordinary case. Thirdly, the assumption that an increase of fresh water, (other conditions remaining the same,) will correspondingly increase the rate at which a given amount of sewage will be cleansed by it, may be an error of practical importance. The assumption is a plausible one, and yet it is possible that a finer distribution of a given amount of putrescible matter throughout a larger mass of the oxidizing agent may, by the excess of the latter, cause a more intense oxidation than with smaller quantities. But it should be remembered that if the latter is the true

state of the case, then are my tables safer than I have supposed them to be. Fourthly, the average rate of purification at given times is very uncertain. So far as I know no attempt has been made to determine it—at least, I have not met with any reference to it. I have taken it as varying with the square of the times in order to err on the safe side in the cases of the shorter runs. Judging from the experiment on which the first table is based I should think it probable that the average lies somewhere between a ratio of the squares of the times and the square roots of the cubes of the times. A third column is appended to Table No. 1, whose numbers (in brackets) are derived from the latter ratio. Lastly, the chemical constitution and the flow of sewage vary greatly in different localities, and in the same place during different seasons and at different periods of the day. This variation, especially in regard to the composition of the sewage, will necessarily be a source of great perplexity in any attempt to forecast the polluting effect which a proposed system of sewers will have on a given stream. In what is known as the "combined system" of sewerage the greatest pollution will probably be produced by short and violent rain storms during the dry seasons, by the casting of large quantities of street washings into a stream before its own volume has been materially increased. It would seem, therefore, that in such a system the storm capacity of the sewers and the average flow of the stream at dry seasons, and the chemical composition of their contents at such times, would be the proper gauges of the relative volume, of sewage and stream, and of the degree of dilution of the former. It must be evident, however, that the topographical features of the town and of the country bordering on the stream may sometimes modify the above general conclusion very materially.

In the so-called "separate system" the maximum discharge of the sewers and the minimum flow of the stream, together with a higher degree of pollution of the sewage itself than in the former case, should always constitute the basis for computing the probable dilution of the sewage.

Notwithstanding what I have said in regard to the defects of these general tables, I still believe that they may be of some service as guides for the approximate solution of problems relating to the expediency of casting crude sewage into streams of potable water, at least until we have more information in regard to the exact effects of that practice under a great variety of circumstances—provided always that due regard is paid in each case to the nature of the climate and the other

important features already alluded to. In the southern latitudes, for example, where the winters are very mild and aquatic vegetation is luxuriant wherever it finds suitable nutriment, I should be inclined to expect that the deductions from the case of the Seine, with the addition of a moderate margin for safety, would find a safe application. In the colder regions of the north a closer approximation to the figures of the first table would be more suitable, while for the middle latitudes I would be inclined to approach a mean between the two.

A means of estimating the time, or the run, needed for the purification of a stream of sewage of average quality by a given volume of water being once established, it will then be, comparatively, an easy matter to determine whether any particular water-course will afford the necessary quantity of pure water for cleansing the sewage of one of its towns before it reaches a lower one, where the water might be used for domestic purposes; or, should the minimum flow of the fresh-water current be given, and the distance in which it is required to accomplish the cleansing, then the average, or preferably, the maximum amount of sewage which would be admissible to the stream may be found by a very simple computation.

Whenever the question related to the restoration of the purity of potable waters great nicety of calculation would be unnecessary, for, as I have already intimated, a large margin of safety must be employed in dealing with problems involving danger to human life. This is especially true in the light of our present lack of specific knowledge regarding the restorative powers of fresh-water streams.

Wherever the water of the stream, in its natural state, is clearly unfit for domestic use, much of the gravity of the question will disappear. Yet even here it must be remembered that such water may be applicable, as it often is, to a great many industries, some of which might be injuriously affected by the organic impurities brought by the stream to their doors. The adjustment of such cases to the interests of all concerned would usually be more easily compassed in the case of potable waters.

Time will not permit me to enter at present into the consideration of the effects of the precipitation of the solids of sewage matters in the neighborhood of the localities where these matters originate. It is an interesting field of inquiry, covered as yet, so far as I know, by mere conjecture as to the sanitary effects of such precipitations on their immediate neighborhoods, except in extreme cases, where the accumulations of sewage matters have in the course of very many years

become sources of rank offence to the senses, and, doubtless, also breeders of disease.

The following are the points which I have endeavored to lay before you:

Firstly. That fresh-water streams have, undoubtedly, the power of destroying organic impurities which are mixed with them, and therefore that it is not, necessarily, unsafe to cast crude sewage into streams of potable water.

Secondly. That the capacity of any particular stream to effect such destruction depends on the degree of dilution of the foul matters, on the original purity of the stream and the degree of disturbance of its current, as bearing on its oxidizing powers; that it also depends on the climate and season, the character of the soil on the bed of the stream, and on the presence of aquatic plants; and finally, on the time of exposure of the putrescible matters to these reducing agencies.

Thirdly. That even the very limited number of facts which we possess in regard to these matters admit of a rough formulation, whereby questions as to the expediency of using any particular water-course as a receptacle for crude sewage may be raised out of the field of mere conjecture to a more scientific and practical plane of discussion. And in this connection I have endeavored to show how the only examples which were availabe for my purpose may be interpreted in the light of certain general principles and adapted to practical use.

In conclusion I desire to express the hope most earnestly that the institution of the National and State Boards of Health will speedily be followed by an enlargement of their powers and the placing of ample means at their disposal for the prosecution of thorough inquiries into the important, but as yet obscure matters which I have endeavored in a preliminary way to consider.

ENTERIC FEVER AND CESSPOOL DANGERS,

As Illustrated by Local Outbreaks on the Mountains, near the Sea, and in a Public Institution.

The State Board of Health, ever since its formation, has had occasion to watch with care the different forms of fevers which from time to time prevail, in order to detect their causes and the best methods to secure avoidance. It may be said of the State as a whole, that its freedom from specific fevers has been fully equal to that of most of the States.

Typhus fever, which prevails so often in the crowded cities of the old world, and which has had occasional outbreaks in this country sometimes occurred at Perth Amboy, when, more than now, it was a place for the arrival of emigrants. The outbreak of last year at Camden county alms-house was an unusual experience. It has always been recognized as a disease of personal uncleanliness and overcrowding and has oftenest had its origin in jails, in close hospitals, or in times of famine.

Typhoid fever has some points of resemblance, so much so that it was long known by the name of abdominal typhus. It has always seemed more directly traceable to the accumulation of foul animal secretions and has seemed to increase with the use of foul cesspools and sewers. Long ago it was not infrequent in New England, amid the valley towns, and in private houses was attributed to the fact that the location of outbuildings was often higher than the house and so as to contaminate wells. There is much ground for the conclusion that it arises in many cases from the dejections of diarrheal patients, or from the mingling of excretal matter with water or air. It is not usually claimed that it arises from vegetable decay, but is always associated with some abnormal animal condition.

There is often occasion to inquire whether we do not now see still another form of fever not always having the special lesion of typhoid fever, but which has many of its symptoms. This view has been so

much entertained as to lead some high medical authorities to speak of what they call a cesspool or sewer fever, seeming to arise spontaneously from breathing air or drinking water contaminated by the stored filth of human and household accumulations. We have had a class of these cases in this state and believe such a view to have some support.

The various forms of Intermittent and Remittent fevers which prevail from time to time, are not different from those familiar both to English and American practitioners, and will continue to vary in frequency and intensity accordingly as the population is subjected to the influences of heat, moisture, imperfect drainage and abnormal vegetable decay on the one hand, and accordingly as human systems by deterioration or exposure are made more susceptible on the other.

We are here to speak of enteric fever, or of that varying form known as cesspool fever, which has been illustrated the last year.

Our attention was first called to an outbreak which occurred in the Centenary Institute at Hackettstown, beginning early last January.

The buildings are finely located on a height, amid beautiful mountains and with good natural surface drainage. The care of the institution was excellent, and the general health of the pupils, until awhile before the outburst, had always been good. So soon as a few cases occurred it was thought best to adjourn the school, both that new cases might be prevented and that the causes might be diligently sought out and remedied. There were in all about thirty cases and four deaths.

The Secretary of the Board made a thorough examination into all conditions which might have seemed to excite the disease. It could not be traced to any person who had come from elsewhere and entered the school, unless it could be connected with a case of so-called malarial fever in Brooklyn. The first case had been exposed to this and was called by the same name, but afterwards seemed to be a possible nucleus of the other cases. The milk supply was chemically examined and found unobjectionable. The water was derived from the mountain and supplied the entire village, in which no cases had occurred.

The inside water-closets and other water-pipes for the removal of soiled water were not all of the best construction, and defects were found which showed that foul gases could find entrance if such were anywhere produced. The outside privies were near and had not been cleansed for several years, reliance being had on natural soil drainage. The cesspool also had been constructed so as to allow all liquid matter passing into it to pass off into the ground, and had not

been cleansed for several years. It was believed that the strata of ground would incline all flow away from the buildings, and so it was thought that the pool would be self-cleansing. Examination showed not only a cleft in the limestone bottom, but also that such a flow away from the buildings could not be depended upon. No doubt was left on the minds of those examining it, that a condition of things was found which would account for the sickness which had occurred. Various details might be recited, but they would only be a repetition of conditions before noted in the Jamesburg and Princeton epidemics. Hot-water pipes that discharged heated water into the sewer pipes may have had something to do with increasing the temperature of the sewage. The trustees delayed the opening of the institute until thorough structural alterations had been made. Many of the indoor fixtures and pipes were altered and replaced by those of more recent approval. The outer privies were rebuilt and fitted up after the trough-closet method, which, with proper cleansing, airing and oversight, is much of an improvement upon the usual school out-house. Two cesspools at a distance were substituted for the one near by, and made so to communicate with each other as to cause constant draughts of atmospheric air, and admit such examination and outflow as will prevent foulness. Although there are those who object to any form of cesspools, good authorities claim that by such an arrangement there is full protection against risk. The officers and trustees of the institute have spared no pains to correct all defects. Yet it furnishes new evidence not only of the need of vigilance, but that everything connected with large institutions, so far as the removal of all *débris* is concerned, needs to be fully known, and that structural arrangements must be such as to secure pure soil and pure air.

Soil saturation with liquid or solid refuse is never safe in the vicinage of large buildings in which many persons live. Foul air is often in winter driven therefrom by the furnace heat and dispersed through the rooms. Headaches and general *malaisé* often occur where there is no specific disease. It is only in flagrant cases or where some sickness has been introduced from without that we have these severer cases.

The other special outbreak occurred along the shore instead of amid the mountains. The following is a brief outline of it:

A fine hotel stands on a narrow strip of land, with a sea-front about five hundred feet before it and a river one hundred and fifty feet to the rear. The building was

erected about five years since, in a bed of sand, free from organic decay and with but little excavation. The water-supply was derived from Long Branch, the main pipe being extended thereto. The water itself seems to have been good. The only defect here is that, because of insufficient pressure as turned on to the water-closets, it cannot always be relied upon for flush, and so may leave the closets without full traps, or, at least, without a supply sufficient for prompt and adequate flush.

The main point was to trace what became of all the liquid and water-closet wash from the closets, the kitchen, etc. It was found that this was carried to two general soil-pipes, which emptied into two separate cesspools outside the main inclosure of the building. The soil-pipes were open on the roof, but were hermetically sealed at their exit and in their course to the cesspools. Between the cesspools and the building there was no trap and no outside ventilation. The cesspools themselves were within a few feet of the closets and one of them in an area of the inclosure. They were miserably constructed of plank and filled to the top. The planks over the top were covered with ground. When opened, we found a heavy mass at the top of mere solid filth. That near the kitchen was a mixture of grease, fecal matter, etc., quite solid and over eighteen inches in thickness. It was in a state of nauseous decomposition. Each of these cesspools had an overflow near the top, so that what did not soak into the ground might be carried into the river, adjacent. One of these was stopped up, so as to allow no outflow except such as took place from the loose tile under the ground. Any foul air from these cesspools must at times have found its way into the soil-pipes of the building, and so could flow out wherever the bath, or closet, or other connections would permit.

Fortunately there were but four or five cases of the fever, and of these none died. We had no doubt of the local character of the disease.

In both of these cases neither the mountains nor the sea are to be held responsible.

The time will never come when either on mountain or at sea, mistakes in dealing with filth will not be dangerous. It is even yet claimed by some good authorities that yellow fever had its inception in the holds of foul ships in mid-ocean.

The third instance is that of a fever epidemic which commenced in December, 1881, in the Hudson county alms-house, located high on Snake Hill. It continued for about five months. The physicians in charge of the institution regarded the cases as being of a mongrel character. We have the same testimony so often given in an outbreak of fever, dependent upon foul air generated on the premises or in the buildings. It was this that led some good authorities to designate between this and the typical typhoid fever, by calling it cesspool fever. One of the attending physicians endeavored to classify the cases as follows: typho-malarial fever, one hundred and fifty-six cases, twenty-seven deaths; remittent fever, ninety-four cases, six deaths; intermittent fever, one hundred and five cases, eight deaths.

The ground on which it was not pronounced distinctly typhoid, was that there was often absence of abdominal symptoms and that a malarial influence was manifest. Yet occurring as it did in winter, it is difficult to regard the malarial symptoms as anything more than a complication. There were many other deaths which were attributed to age or feebleness, which no doubt were hastened by or depended upon the bad local conditions. The attention of this Board was not drawn to the institution during this epidemic, but an after-inquiry into symptoms and details, left no doubt as to its pythogenic character. The crowded condition of the building, which had over eight hundred inmates, and other complicating evils, must have exposed its entire population to foul-air influences. A general condition of *malaisé* was recognized even by those who were not susceptible enough to have any severe attack. Over one hundred deaths occurred, most of them incident to this outbreak. Besides the ill adaptation of parts of the building for its purpose, its ventilation and sewerage systems are very defective. A letter addressed by the Secretary of this Board to the Clerk of the Board of Freeholders refers to it thus: "The sewage system of the almshouse is strongly to be condemned. On the inside the trough-closets and other appliances are in poor condition. The soil-pipe runs out into a great privy cesspool. Into the two privies come both this and the asylum sewage. They are too near the building, and the whole arrangement is practically wrong. All the ventilation there is opens toward the building by means of gutters, save the one soil-pipe which is ventilated on the roof but not outside the building. There is no need of any outer cesspools, as attachments to the direct sewer properly trapped and ventilated by an outer shaft would give all conveniences. Some attention needs also to be given to the general drainage of the ground here. Although elevated it is naturally wet and suffers from dampness by its relative position." . Besides other sources of bad air sufficiently pronounced, the fecal and cesspool emanations could not but have permeated the building.

Thus we have had the last year three endemics of fever in very diverse circumstances as to locality, yet all in districts and positions chosen for their salubrity. They are alike in having been the victims of cesspool befoulment. If we insist upon storing the varied offalings of animal and vegetable decay, instead of removing or utilizing it, as nature has indicated, there is no mountain or hill so high and no sea air so pure that man's device may not concentrate pollution. True, the penalty does not always follow quick upon the mistake.

Nature is so grandly conservative, that she herself utilizes and amends many of our errors. Then again it often takes a union of forces to develop the result. Stored filth may not stir into disease at all if neither heat nor moisture is applied. Sometimes the depth of covering protects; sometimes its thickness and undisturbed coating makes a hermetical seal; sometimes fermentation occurs instead of putrefaction, or the mode or time of breaking up is propitious. We cannot always tell why one real case of scarlet fever is benign and another malignant, or why an epidemic of the same disease, as diphtheria, is managed easily in one house and in the other carries off a whole family group. But we do know enough to know that any system which stores filth or manufactures sewer gas, and holds these in readiness for thermal or atmospheric or personal conditions that may exist, is *extra-hazardous*. We know it is not the fault of many a household, and especially of many a crowded hotel, that they have not received any sickness adequate to their arrangements therefor. But let not the warnings we have had repeated year after year in the State be lost upon us. This variety of fever is of household origin and must have its correction or prevention by the application of well-known sanitary principles, to the cleansing or removal of all things connected with life and indwelling which are not promotive of health. While we shall never cease to make some errors, with the application of principles and methods now well understood there is no reason why typhoid fever and its allied types of disease should not forever cease to occur.

SANITARY INQUIRIES INTO THE CONDITION OF CHARITABLE AND PENAL INSTITUTIONS.

As early as 1866, in the appointment of a State Sanitary Commission, it was made a part of its duty to look after the dependent classes of various grades. In the general law of 1877, as a part of investigation and inquiry in respect to the influence of conditions and circumstances upon the public health, this Board recognized these classes as somewhat included in its inquiries. Accordingly, in the fourth report will be found a detailed account of the condition of jails in Warren, Morris, Middlesex, Essex, Union and Somerset counties. Also the record of examinations made of the Warren county alms-house, Morris county alms-house, and of the Newark city and Elizabeth city alms-houses, and a few of the township alms-houses of Essex county. Special visits had also been made by the Secretary to the county alms-house and asylum of Camden county, to the jail of Camden county and to the State Reform School, in the sanitary interests of the State. The last Legislature, by a special act, empowered the Board to inquire more fully into any State, county and township alms-house, asylum, prison, jail or other public institution, and to report upon the sanitary condition of the same. Circulars and correspondence soon revealed the fact that very different systems as to these prevail in different sections of the State. Our public institutions, viz., the state prison, the two reform schools and the two asylums are under well-known and well-organized supervision.

Essex county has a penitentiary near Caldwell, having a farm of forty acres. Work is done by the convicts—they average about one hundred and thirty in number. The institution is well conducteed and in most of its sanitary arrangements is a model.

Hudson county has a penitentiary at Snake Hill, averaging about three hundred convicts of terms of one year or less. Stone quarrying and other industries are pursued and the system is well managed. All of the counties have county jails. Most of these are connected with

the court-house and are under the supervision of the Sheriff. Those in Essex, Hudson, Passaic and Union are under the charge of wardens, and two of them are separate from the court-house buildings.

The State prison and the jails of Camden, Cumberland, Salem, Essex and Hudson counties have been visited by the Secretary of the Board and carefully inspected. Either by direct personal meeting with officers or by official letter any defects have been carefully noted and recommendations given. Letters which are on file will show how important has been this work, and how many of these needed this kind of inspection. It is known that already some important changes have been made. It may be said once for all, as to all visits to the various institutions of a penal or charitable kind, that there has been manifested the most earnest desire to know sanitary defects and the assurance that requisite changes would either be made or fully considered.

The city alms-house of Paterson, the county jail, and some of the pauper insane were visited and examined by Wm. K. Newton, M. D., and a careful report made to this Board as to them is on file.

ASYLUMS.

Full reports were received from both of the State asylums in reply to a schedule of questions and such additional particulars given as were needed. With these full reports and the knowledge already had of the structural arrangements and sanitary administration of these institutions by the Board, it was not deemed necessary to make a more special inquiry this year. Besides a few insane or demented persons to be found in various alms-houses, there are in the State eight county asylums, in which are to be found inmates of all grades of derangement, and of all varieties of skilled and unskilled oversight.

The counties which have these asylums are thus enumerated, the number of inmates being given as by the last State tax allowance. Those which are either in a building with or adjoining the county alms-house are marked with a star.

Burlington county,* sixty-four (Pemberton); Camden county,* seventy-nine (Blackwoodtown); Cumberland county,* ten (Woodstown); Essex county, three hundred and twenty-eight (Newark); Gloucester county, three (Clarksboro); Hudson county, two hundred and twenty-two (Snake Hill); Passaic county, thirty-six (Paterson); Salem county, seven (Salem.)

These, with the average of about five hundred and fifty in the State *asylum at Trenton*, (thirty-seven being convicts), and five hundred

and thirty-five in that at Morris Plains, give an aggregate of one thousand eight hundred and thirty-one, of which a little over two-fifths are in county asylums. As the State not only pays an allowance for these, but also needs to recognize all as related to the social and industrial interests of the people, it has need to exercise over them some form of intelligent oversight. With the demented still in alms-houses or in private families we find an aggregate that may well attract attention in our study of the causes which improve or deteriorate population. The statesman and the citizen not less than the professional man, need to study the best methods of care and the possibilities of preventing this increasing element in our modern civilization.

In Burlington county the asylum forms a part of the alms-house with its three hundred and twenty inmates. The general care is under the special superintendence of a matron, and a physician visits the institution as often as is necessary. The cells, with the exception of three or four, are properly located.

Camden county has its asylum on the same grounds as the alms-house, but in a separate building. It, too, is under the superintendence of a matron, and has the same visiting physician as the alms-house.

Cumberland county has its asylum under the same superintendence as the alms-house, but is not as well attended to. The asylum building is adjacent to the alms-house, but because of the small number of inmates (ten), lacks that expert care which larger institutions can command. Three epileptics are kept in the other building in rooms not well adapted for them.

The asylum in Essex county is so large as to command all the advantages of skilled administration, and of those skilled in dealing with this special ailment. Although the present buildings are in some respects well suited to their purpose, as the property belongs to the city and not to the county, new buildings are being erected, which will probably be completed in about three years. There is no reason why this institution should not illustrate the best methods of alienistic care.

Gloucester county has a small brick building on the same grounds as the alms-house, fitted for nine persons, but containing only three. All bad cases are sent to the State asylum.

Hudson county has an asylum adjoining other county institutions on Snake Hill. It has a number sufficient to secure the services of a

resident physician and is in many respects managed according to the most approved methods. The new part of the building is admirably adapted for its purposes as to its halls, its rooms, its heating and ventilation and its change from sitting to sleeping corridors. In those rooms where close confinement was necessary, the contrast with some similar rooms in smaller asylums was very great. Those who in the latter always slept on the floor because of their destructiveness of beds and clothing, were here provided with a form of elevated bed which is used, so as to secure greater comfort and cleanliness. It was in marked contrast with similar cells seen at two other places.

Passaic county provides for between thirty and forty inmates.

Salem county. The asylum building is here adjacent to the alms-house. Although the asylum has but few inmates, like other small asylums it suffers for want of classification and administration. Both it and the alms-house were found so defective in many particulars, that the Secretary felt it to be necessary to meet members of the Board in person so as to complain of its condition and suggest changes. No one could thus visit the various asylums of our State without recognizing that the care of this portion of the population, either in a charitable, social or economical view, is a responsibility needing careful management. The time has come when it will not do to trust to routine methods or to look upon such institutions as only local or ndividual in their character. Two thousand such dependents as these need study as to causes, as to treatment, as to classification, as to system of provision—often quite different for the acute and chronic insane—as to possibilities of employment and amusement, and as to the relation which county or city asylums should bear to the State. While great ability of management is discernible in some of these, it s not so always. There is want of unity of system and oversight. The system of freeholder care needs somehow to be kept free from political changes. In two or three instances changes of administration have simply been the result of party changes, and all institutions of harity are imperiled by such methods. In others there is no attempt at expert management. Both charity and social economy require a more comprehensive oversight. Asylums for less than one hundred are sure to suffer for want of administrative care and of that skill which has familiarized itself with insanity in all its forms.

ALMS-HOUSES.

Great difference of method exists in the State as to the care of the indigent. Most of the larger cities have city alms-houses, whose officers derive their authority from the Mayor and Common Council. Several of the counties have county alms-houses. In other cases some of the townships combine in a common alms-house. Many townships have alms-houses of their own. Some have a system of out-door relief, and a few still cling to the old method of farming out the paupers.

The following counties have county or township alms-houses:

Atlantic county; Bergen county, one for eight townships and one for three; Burlington county, Pemberton; Camden county, Blackwoodtown; Cape May county, Cape May C. H.; Cumberland county, Bridgeton; Essex county, city and township houses; Gloucester county, Clarksboro; Hudson county, Snake Hill; Hunterdon county, township houses, etc.; Mercer county, city and township houses; Middlesex county, city and township houses, etc.; Monmouth county, township houses; Morris county, county house, Boonton; Ocean county, mostly township houses, but some townships reserved a right in the Monmouth county house; Passaic county, county house and city alms-house, Paterson; Salem county, county house, Woodstown; Somerset county, township houses; Sussex county, township houses; Union county, city and township houses; Warren county, county house, Townsbury.

Of these, that of Hudson county is the largest, numbering between eight and nine hundred inmates. Nearly all of the county alms-houses have been visited. It has been our habit to make direct report as to all these institutions to the Board of Freeholders or persons in charge. Various matters needing attention were referred to and such suggestions were made as sanitary defects required. It was not deemed necessary to make any public criticism or even to give copies of communications in this report. This is all the less needful because in many instances prompt response has been made to these communications by structural and administrative improvements.

From various city and township alms-houses returns in answer to sanitary inquiries are on file in this office.

It is impossible to calculate with absolute accuracy the number of the pauper class as indicated by these returns. It cannot, however, fall short of from six to seven thousand. This, with a prison and penitentiary population of sixteen hundred, and a jail population of

one thousand, and reform schools three hundred and fifty, and asylums two thousand, makes an aggregate of dependent population of about twelve thousand.

Of all questions relating to methods of dealing with dependency, none are more important than those which relate to sanitary conditions. While this Board cannot with present provisions attempt a close examination of the smaller institutions, it has thus been able to extend to most State and county institutions a sanitary inquiry which, it is hoped, will be found to have been of advantage to these institutions and will help to awaken the attention of citizens in the various counties to the importance of attention to those influences which may limit dependency and crime. Not only the influence of intemperance but that of various other evils needs to be closely studied. Much is to be done not only in improving the condition of these and in diminishing their number, but in overcoming that thriftless tendency which is so apt to adhere to families or to communities.

HINTS WITH REFERENCE TO THE REGULATION OF MOISTURE IN ROOMS.

BY PROF. C. F. BRACKETT, PRES. OF STATE BOARD OF HEALTH.

I have been requested to discuss briefly the question of moisture in the air of our living-rooms, with reference to its regulation. The object which it is desirable to secure is the maintenance of such a rate of evaporation from the surfaces of our bodies and respiratory organs, as shall be requisite to keep them in proper condition for the discharge of their normal functions. Common experience teaches that very important relations exist between the temperature, moisture and other conditions of the air, and our feelings of comfort or discomfort.

The bodies of living beings, while in some respects self-regulating, are yet subject to the same laws which control the actions of matter in general. The unceasing molecular and atomic changes on which life is conditioned are productive of heat in the body, as they would be if they took place without it. How this heat is expended so as to maintain the normal temperature, which is in all climates found to range between 98° F. and 100° F., will be obvious by considering a few facts which have been ascertained by careful observation.

Under conditions ordinarily favorable to health it is found that 72.9 per cent. of the heat given off by the body escapes by radiation, 14.5 by evaporation from the skin, 7.2 by evaporation from the lungs, 2.5 by heating the air from breathing and 1.8 by the solid and liquid excreta. It is thus seen that about 22 per cent. of all the heat which leaves the body passes off by evaporation. If, now, such conditions supervene as shall tend to increase or diminish this evaporation, corresponding disturbances in the system result, and though it possesses powers of compensation which are called into action by such disturbances, their exercise may greatly interfere with our vocations, comfort and health.

Now the quantity of water which is required to completely saturate a given space with vapor is dependent upon the temperature of the space alone, it being exactly the same whether air be present or not. Moreover, the amount is, for every given degree of temperature, definite, so that having once been reached, no more can be taken up. Suppose that we are in a room whose temperature is, say, 99° F., and that the room has been supplied with all the vapor of water which can be taken up at that temperature, plainly, although the surface of our bodies as well as that of our lungs may be completely bathed with moisture, no relief from evaporation can be had. If, however, less moisture is present than is required to saturate the space, the process of evaporation will be set up with corresponding abatement of heat and relief of discomfort.

If, again, we suppose the air of the room to be perfectly dry, a condition not met with in nature but one which may be produced by artificial means, we shall experience equally disagreeable and injurious effects.

Now the atmosphere in which we live may for our present purpose be regarded as composed of two perfectly distinct gaseous bodies in a state of mechanical mixture, viz., air and watery vapor. These, like all gaseous bodies, are subject to the laws of diffusion, so that they become uniformly mixed throughout. And we may, without error, speak of the air as saturated when the space occupied by both contains all the vapor it can contain at the given temperature. Now the capacity of air, in this sense, rapidly increases with increase of temperature. Thus if one pound of air at 32° F. were saturated with moisture it would contain .00379 pounds of water. If, now, the whole were heated to 42° F., it would no longer be saturated, since at this temperature a pound of air would be capable of holding .00561 pounds. Merely heating the pound of air together with the vapor contained in it has changed its hygrometric state from complete saturation to one which is only 68 per cent. saturated. In like manner, if the temperature were successively raised to 52°, 62° and 72° F., the corresponding degrees of saturation would be 46, 32 and 23 per cent. If we assume that the temperature of our living rooms is to be maintained at, say, 72° F., our sense of comfort will depend on two factors, jointly, the warmth of the air and its condition as regards dryness. If we rely on open fires, which radiate their heat without warming the air directly, but do so by first warming the walls of the

room, which afterwards warm the air moderately, we shall be obliged to admit so much moist air from without that there will be little danger of too much dryness. But if we employ stoves the case is altered. Their more advantageous positions and dull radiations enable them to sufficiently raise the temperature without the expenditure of large amounts of fuel, and therefore with little necessity for admitting large amounts of fresh air, and it hence results that on the temperature being raised the degree of saturation with moisture falls very low and most uncomfortable dryness results. This is obviated by placing a vessel of water on the stove in such a position that it may be heated and give off vapor more or less copiously. In order to present the principles involved clearly, let us suppose we have a stove in which we have to burn 40 pounds of coal in the course of ten hours, in order to maintain a temperature of 62° F. when the outside air is at 32° F. Now 4 pounds of coal per hour will require 1200 feet of air for its combustion. This will weigh about 91.3 pounds and will contain, at 32° F., 0.346 pounds of vapor. This would be intolerably dry, for the degree of saturation would be only .23. Let a vessel of one foot area contain water and be so placed on the stove *that it will be kept at a temperature of 122° F.* This vessel will yield 0.538 pounds of vapor. We shall have then, altogether, 0.884 pounds of vapor brought into the room every hour. But 91.3 pounds of air at 62° would require for complete saturation 1.0764 pounds of water. We thus have an atmosphere too damp—about 82 per cent. saturation. If we reduce the size of the evaporating vessel one-half we shall add, other things being constant, about 0.269 pounds of vapor to that brought in from without; and secure a degree of saturation of about 57 per cent. This may be called a dry atmosphere, since it could sustain much more vapor; accordingly, every article that is exposed to it will continually give off such moisture as it may contain. The same will be more emphatically true of less degrees of saturation.

It appears, then, that with the conditions supposed we may if we would secure a moderately dry and healthy atmosphere, so place an evaporating vessel as to secure the evaporation of somewhat less than a half a pound of water in an hour, (between 0.269 and 0.5381 pounds).

This may form a basis for regulating the amount of water that is to be evaporated on stoves. If we are to consider the case of furnaces where a large amount of fresh air is to be heated and thrown into the dwelling, the case is complicated with the numerous details of con-

struction, the rate at which the air is admitted to the heating chamber, etc. No doubt the most satisfactory plan is to have recourse to observation of the wet and dry bulb thermometers, and by their indications regulate the exposed surface as to extent and proximity to the fire-pot till the proper amount of evaporation is secured.

NOTE BY THE SECRETARY.—We draw special attention to this brief statement of the vexed question as to whether water on stoves, or for furnaces, is desirable. A proper degree of artificial moisture is often needed for our comfort and health, in a stove or furnace-heated atmosphere. By an accurate statement of the problem itself, and the influence of relative conditions, we are brought to see that there is a method of quite accurate determination. In the absence of this, our only plan is to have a vessel of water such as is named; to note its temperature and the amount evaporated in any given time, and so form an estimate of the degree of evaporation most generally acceptable or desirable. This approximate indication with our feelings and sensations will often aid us in adjusting the heat and moisture of a room atmosphere to health and comfort.

LOCAL SANITARY INSPECTIONS

Of Sea-side Resorts, Etc.

BY EZRA M. HUNT, M. D., SECRETARY.

The State Board of Health has for more than a year past been making sanitary inquiry and investigation as to some of our most growing towns, with a view of informing itself of the exact sanitary conditions, and of suggesting changes to the local Boards of Health. It was thought best at first to direct more special attention to seaside resorts, because their rapid growth and the summer crowding of population especially inclines them to insanitary conditions.

It is the object of this paper to give an outline which will indicate the present sanitary status of the most important of these and a few other localities, and to point out desirable improvements. We shall not need to attempt to conceal any real defects, because the spirit of inquiry we have found indicates a desire to secure the best sanitary conditions, and because many of the suggestions made will no doubt be acted upon by the time this report is in print. The record will be all the more serviceable because by it we shall be able to point out evils and their remedies, such as are equally needed to be known by many other cities. Thus we shall hope to aid in giving direction to sanitary improvements throughout the State.

Having noted two of the most prominent seaside resorts on our more southern coast, and one of the growing inland resorts recommended for invalids, we will then turn to some of the growing villages and cities along the shore of eastern New Jersey.

As the chief design of our inspection was, first of all, to find out what city, borough or township provisions are made for drainage, water-supply, sewerage and the removal of all garbage, etc., we have first of all inquired into them. In addition, inquiry was had and examination made of various hotels, not for the purpose of speaking of them individually, but that we might know the general condition of large

buildings to which the people are invited to resort, not less in the interests of health than of general recreation. The New York Tribune, in a recent notice of healthy summer resorts, speaks thus:

"The New Jersey Board of Health has begun the examination of the sanitary condition of the seaside resorts along its coast. It is a necessary work for New Jersey, both humanely and financially. The summer boarder is now a more profitable crop in that State than sweet potatoes or whortleberries. It is a harvest which has only grown up within the last ten years, and which yields millions of capital to the Jerseyman; and it is a harvest which will as rapidly disappear if these very measures of precaution which are now inaugurated by the Board of Health are not carried out.

"From Sandy Hook to Cape May mushroom cities have sprung up, many of them under the patronage of some religious body. An enormous amount of capital has been invested all along the coast. Land which ten years ago would not sell at $5 per acre now is eagerly bought up at thousands. Even during the winter months the hotels at some of the resorts are crowded, physicians having discovered that the air of this coast is as mild and curative as that of Nice and Mentone. There is no reason why these resorts should not succeed, and the New Jersey coast prove a convenient and close sanitarium for this city and Philadelphia, but one, and that is the problem of drainage. The soil, being sandy, is porous as a sponge, and absorbs all the poisonous matter from the surface, transmitting it to the wells. The problem of proper drainage is rendered more difficult by the tidal streams which return all decomposed and noxious matter to the shores. It is a difficulty easily overcome, however, if taken promptly and energetically in hand, as the State is beginning now to do. The native population along the coast are the purely conservative kind who hold on inexorably to the pig-pens, open drains, foul smells, decaying fish and other abominations of their ancestors as to precious heirlooms. A few stringent laws will be necessary to teach them that their pure sea air is their only valuable capital, out of which they can make a comfortable living if they will keep it pure."

The rapid popularity of the coast, tempts to the derangement of its natural advantages to a degree which the hasty devices of speculation have already begun to illustrate. Here are the stipulated conditions on which some of them have already proceeded. Pay no attention to natural drainage. Make no provision for artificial drainage to compensate for structural changes. Grade and upheave, so as to ignore all natural laws. Instead of draining a pond, make of it an artificial lake. Hide the salt meadows, or the more organic deposits of higher vegetation, by sea-sand or river-mud. Build rapid cities, and notwithstanding the rapid pollution of ground, with no vegetable growth to utilize it, assume that the water will be good, because the oldest inhabitant says it always has been good. Rush in an unsettled population, which has far more complicating conditions than the sudden occupancy of a city by a great army, and gather the solid and liquid

tonnage of all excretions and offalings into cesspools, that will let it out all over the ground, only a little under, so as to be concealed from sight. Repeat this, year after year, on the hypothesis that it will take care of itself. In the absence of classified facts, assert the perfect healthfulness of the city. Do not admit that any deterioration of health from these causes can take place, unless there is a summons from typhoid or typhus fever, or some other specific epidemic, to quit. Let all the other tax on vital force and vigor count for nothing, and even if this comes, explain it away as being brought by summer boarders." This plan has been adopted in many a mountain district, until fevers have discredited mountain-air. It is still adopted in many inland towns which are not health resorts. Our coast is thus far fully on a par with other watering-places. It is only because we desire that it shall excel them, that the note of warning is sounded in time.

Of this coast, as a whole, reaching from Raritan bay to Cape May, as furnishing localities for towns, cities, and for health resorts, too much has not been said. Its location as to the great ocean, its accessibility to centres of trade, its forests and plains, its soil and climate, give facilities of adaptation, and promises of salubrity, such as will continue to invite increasing population, unless art succeeds in subverting what nature has devised. But all along, certain governing principles must be held in practical esteem. Climate and health are made up of many factors. Good locality in a temperate clime, fitness of geological structure, pure air from sea and land, and good water already determine many things in our favor. Yet these are not to be assumed to be entirely the same, even at adjacent points. Here and there changes occur in the underlying ground which must be understood. Rivers flowing toward the sea differ much as to their banks, their rapidity of flow and their deposits. Even amid wide stretches of sand and gravel, beds of organic matter are found. Water-supply differs much according to the water-shed it represents or the character of the soil through which it is drawn. Even when equally good as to healthfulness it may have taste derived from mineral or vegetable matter. Prevailing winds and the kind and extent of near forests have much to do with climate and health. So in choosing amid good localities, there is room for much variety. Again, independent of such structural arrangements as have to do with buildings, there is great difference in the preliminary or constant surface work which different localities need.

Some places are made unhealthy by the mere upturning of the soil.

There are kinds of ground, of drift material, and of rock, which, in their exposure to the air and in their disintegration, produce bad air and disease. There are meadows which ought not to be covered up, and mud of rivers which ought not to be used for filling in.

There are many places in which underground drainage is the one essential thing, before there is any building, so that a dry, well-aired groundwork can be secured.

There are other places in which the natural drainage is just sufficient, but which need additional aid in this direction so soon as buildings begin to be erected. We could point to two or three places on the coast in which there is reason to believe that excavation and imperfect drainage have already started causes of malaria, which will continue unless the evil is appreciated and the remedy applied. Yet, as a whole, the stretch of sea-coast is as free from malaria as any mountains on the continent.

Another frequent and suspicious occurrence along the shore, is the interference with natural water-courses, either by inattention to natural underground drainage, or the partial stoppage of waters in their course to the sea, by artificial ponds or lakes, or the impounding of tidal sea-water, or the mingling of stagnant fresh and salt waters, so as to make of little natural ponds a something that can be called a lake. It is not always that such lakes are a nuisance, but all such stoppage of water near its exit to the sea, is to be presumed to be an error, unless high engineering authority can show why any given case is an exception.

CAPE MAY.

Cape May, as the first important city at the southern extreme of the State, may first engage our attention. Our examination of it was made in April, 1882. It is a city of about eighteen hundred permanent population, but in summer, varies from fifteen to twenty thousand. Of its climate, we need not specify at length, since its advantages in this respect have been so often set forth. Yet it is well to note that the more closely we study its climatology in relation to disease, the more apparent is it that it has an evenness of temperature and a freedom from frost more than its latitude and longitude would indicate, and deserves, as does much of our coast line, a careful study in the interest of health. When we recently had occasion to compare data as to disease, with those of Professor Smock as to climatology,

it seemed quite apparent that a very hopeful study presented itself as to the special climate conditions of this section.

The soil of Cape May is admirably adapted for a city. It is a common fallacy that sandy soils, as being so loose and porous, are best adapted for close population. The fact, however, is, that gravelly soils are much preferable as percolators, and that alternate layers of gravel or mixed soils serve much better to dispose of organic matters that may reach the surface. The soil which underlies Cape May city is mostly gravelly, with sand under the gravel-bed, and then another layer with bay-shore gravel.

Where there is filling in, this is often done over salt-meadow land. Although this made ground, at present, makes up but a small portion of the city, and although the salt marsh is underlaid by gravel and sand, it would be wiser, in the filling in, to provide such drainage as would help to dry out this intermediate layer of organic matter, which, by the covering, becomes a subsoil too full of organic matter. The water-supply of the city is well managed and of excellent quality. It is derived from three sources: Two of these are large circular wells which go down into the gravel-bed, and are not in the same strata as most of the old wells of the town. These strata are in most places divided by a narrow strip of clay, so hard as to need the pick in excavation.

The water from the upper well is pumped up by the Holly system into the tank at the lower well, and from both there is a supply sufficient for the ordinary uses of the city.

About sixty feet from the second gravel-bed well is an artesian or bored well ninety-seven feet deep. In the boring of this, at about ninety-four feet, a cedar log was reached which had to be bored through. Just beneath this a good supply of water was secured. An eight-inch pipe leads down to this supply. The water is pumped by steam to a tank thirty-four feet high, having a capacity of sixty thousand gallons. There is also another tank with a capacity of thirty-five thousand gallons. The steam pump can raise sixty-five gallons per minute.

The water generally stands in the tube of this well at thirteen feet from the top. In very dry weather when in use it has gone down to eighteen feet, and has been pumped to twenty-two feet as the lowest. All whom I have been able to consult regard the supply as inexhaustible. The water is soft and pleasant, and quite tasteless unless a slight sulphur taste is perceptible.

We think it can be said that the city has a good and abundant water-supply. Here and there a cistern is still used, but this is scarcely needed. The poorer classes still depend upon wells which vary in depth from ten feet to sixteen feet. It is desirable to discourage the use of surface water and also to look after the abandoned wells, that these be filled up.

It is worthy of notice that one other artesian well was attempted previous to the one now in use. This was put down to the depth of two hundred and twenty-four feet, and this reached salt water impregnated with other minerals so as not to be fit for use. It is probable that the failure was owing to over-deep boring or to some change of strata. If need ever requires, it is quite probable that other artesian wells can be provided. On the whole it can be said that few sea resorts on such narrow strips of land can be found with so good a water supply.

Sewers. A careful examination was made of the sewer system of Cape May city. Some changes and repairs which were being made gave an excellent opportunity for careful examination.

The main sewers were constructed about thirteen years since and additions are from time to time being made. The city has no map of its underground structures, and like most of our cities much needs a complete sanitary map. The gradients of the different sewers could not be obtained, but there was good evidence that they are fairly flushed and that the fall is sufficient unless some special hindrance occurs. One sewer which was being taken up on account of deficiency of fall, illustrated the fact that portions are sometimes laid with too little fall. There is obstruction because there is irregularity of fall more frequently than because from "end to end there is too little fall." This sewer consisted of large drain pipe laid about ten years since. The pipes and cement were in good condition. The obstruction found had been caused by a variation in grade, which had apparently been made to suit a gas main, and only requiring the simple remedy of raising the line of pipe before it was reached. The pipes beyond this were so clean as to show a good flushing. They are all of vitrified pipe except a part of the terminus of one, which is of hemlock. The outlet of these sewers is by three distinct channels—one into Hedges' creek, quite out of the town, and the other two into Cape Island creek, not far from each other. Hedges' creek carries about two-fifths of the sewage and the other two the remainder. The whole system is between three and four miles, but accurate data are wanting.

As the emptying is into tide-water at points where the tide rises from three to four feet, the mouths of the outlets are covered a part of the time, but not so long as to interfere with frequent delivery. For this reason there should be more frequent man-holes. The sewer-pipes are from ten to sixteen inches calibre, and often unnecessarily large. They carry all the storm-water which enters by gully-traps at the corners of streets. At some of these, there is free ventilation. We think that these underground sewers should all have free access to the air by frequent openings, so that they can be flushed by the breezes, and so that sewer-gas cannot have either a place for production or for lodgment.

It is much easier to keep sewer-gas out of these sewers than it is to keep it out of hotels and other public buildings. For reasons hereafter to be given, we urge upon the Board of Health the keeping of house sewer-gas out of the sewer system, *by free ventilation of the sewers, and by intercepting all house sewers by a trap between the house and outside system, and by a ventilation either by man-hole or shaft on the house-side of the trap.* Have no conveniences for the manufacture of sewer-gas, and protect yourself from the modern-convenience plans of manufacturing sewer-gas which are mostly to be found inside of buildings. It is not only good in theory, but the best practical way, in such cities as this, of teaching householders and hotel-owners that the city has more to fear from them than they have from the city.

The garbage of Cape May city is carefully excluded from sewers, and seems well removed by those living at a distance whose interest it is to remove it fresh for use. Yet it is well for all local Boards to have the mode of removal under supervision, and subject to ordinance, if need be.

We now come to speak of the conditions of hotels and residences, as related to outside sanitary conditions.

We find at Cape May the structural provisions for water, for disposal of sewage, and for all that relates to outside sanitation, either good or capable of easy correction, and a Board of Health which comprehends its work far better than is usual. The chief lack is in the sanitary inspection and fitting of buildings—a lack common elsewhere, but especially needing attention at summer resorts. Buildings occupied but part of the year are especially exposed to insanitary disorders. Water is drawn off, so that all traps are emptied or left imperfectly sealed by foul water. The buildings thus become ventilators to the sewers, while the few that remain to care for them are usually totally

ignorant as to what constitutes sanitary care. Rats and rust do their work on the pipes. Thus walls are saturated with bad air, and no building is fit to be used, unless a *sanitary expert* and *an honest* and capable plumber have thoroughly examined it before re-occupancy. This is especially true if it has patent tubs, patent water-closets, and all the modern conveniences. We have examined here and elsewhere, many a hotel, in which the chief evil arose from the fitting up of its artificial systems. With such water-supply and delivery as Cape May possesses, and such sanitary care of buildings as might be had, it ought to be a health resort equal to any in the States. There is little danger from sewer-air in Cape May, save such as is made in the buildings. It will not be made or kept there, if thorough cleanliness is preserved, and if the machinery for indoor appliances is not as it usually is, defective. Although we have the record of facts in detail, we do not propose to speak of any hotels by name, either here or elsewhere, since they are so much alike, and since so many of them need some alterations, or the skilled oversight of a sanitary engineer. In many, traps are defective, fixtures are rusty and leaky, workmanship about them is imperfect, ventilators are not carried to the roofs, and there is no outside man-hole or other disconnection so as to allow all inside pipes to be flushed by currents of air. Even the school or trough-closet might, in many cases, well replace more elaborate constructions. The pan-closet, as we find it in most hotels, is very objectionable. It is not worth while to be fitting up contrivances which complicate and then call them health-preservers. These do not often originate specific diseases, but if such happen to be introduced from other places, these unfavorable accommodations provide for the extension and multiplication of cases. The principle which should apply to all inside conveniences where the delivery is by water-carriage, is that of regulated flushing by air as well as by water.

It is for this reason that with the exception of a single trap in the house to each basin, closet, etc., and one outside of the house and beyond an air opening, modern sanitary engineering is adopting fresh air as a disinfectant and discarding many of the artificial complications. If the Boards of Health of our summer resorts could, in addition to general oversight, have a skilled inspection of all hotels and boarding-houses early enough each season to secure right structural conditions, such places as Cape May could be even more fully guaranteed as to health and comfort. As it is, we find the Board of Health of this city intelligent as to its duties and efficient in its work.

Cape May Point is located about two and one-half miles from the city. It has no sewer system, but a water-supply similar to the gravel wells of Cape May. It is at present a healthy resort, but if growing, will still have to settle some questions of health care.

ATLANTIC CITY.

This growing summer and winter resort has a constant population of about seven thousand and claims a summer population of sixty thousand, more or less. It foundation is upon sand. This, in modern times, is not unsafe unless it leads to the false view that everything that soaks into the ground keeps on going in, and so will remove itself without any plan or aid from man. Mere strainers do not dispose of organic matter if it is very abundant. The present water-supply of the city, with the exception of a few wells, is by cisterns. These are mostly built above ground or only partly beneath it, and made of brick and cement. There has been some complaint that when not well protected they absorb gases, but in general the people regard the supply of water as good. This opinion is not so fully shared in by visitors. A company has been formed to supply the city with water from what is said to be an unexceptional source on the mainland—the pipes are already being laid. We think there is much need for this improvement, and that a full supply of good water is needed from a reliable and unfailing source. Next to this, cisterns properly built and properly cleansed are reliable. The city has no sewer or water-carriage system and does not at present contemplate one. The reason given is that it is difficult to obtain sufficient fall, and that they hope to be able to manage other systems. How to do this after water is introduced is not so clear. Now that one million of gallons of water can be raised a foot for about nine cents, we do not need to consider lowness of grades as an objection where there is an ocean or large creeks for discharge. No city on the coast can better afford to devise and execute a system in accord with the best sanitary engineering. The storm-water is partly conveyed off by wooden conduits which run out and discharge upon the meadows. The city will yet have to choose between a sewer system or an increase of filth. Fecal matter is mostly received in privies either above or below ground, according to the fancy of the owners. Two odorless excavating machines owned by private parties serve for the cleansing. While there are some rules as to emptying, and while complaints are heeded, there

is not such an administrative system as would be approved in any city of efficient sanitary police. In one hotel where a water-carriage system had been arranged, the management was anything but satisfactory. It is not impossible that the dry system might be a successful one. It can only be so where the form and condition of privy vaults and the modes of removal are regulated by ordinance and enforced by a sanitary inspector or police—with the most rigid accuracy—or conducted by the city itself.

The dry system as here attempted, leaves a large amount of liquid slops, kitchen drainage, wash-water, etc., to be disposed of by other methods. This is generally received into open cesspools, and what does not get out into the sand is carted off in wagons to a meadow, a mile from the city, where it is from time to time imperfectly composted. The carting is done by individual arrangement. Some avoid this by a succession of two or more cesspools and a more general discharge into the ground. Some of the residents speak with great confidence of the power of this loose sand to dispose of all liquid refuse. One of the most prominent physicians said that the soil is so loose that all liquid refuse is sure to percolate through the soil and find its way to the sea before any harm could be done. While, therefore, believing in general removal, he did not think a sewer system required, or that cesspools would do harm in this city for the next thousand years. Notwithstanding this, we found pits where bath-water without grease did not drain off from shallow vats, and where cesspools were full to the top with liquid filth. Grease tanks were not generally in use. While a method of interrupted irrigation might be practicable if done on a system, we failed to see that by any cesspool system, the ground could be permanently relied upon for safe disposal.

The garbage is disposed of by contract to parties who collect it, it is said in an unobjectionable way, and carry it in sealed packages or donigans to the country. The two districts into which it has been successively carried for the last two years, have protested, and now it is delivered to a market-gardener near Haddonfield.

In individual cases, we found great attention being paid to sanitary conditions—in some with measurable success—in others with great failures. The Board of Health is earnest in its endeavors. Public sentiment and the new Board are now attempting the solution of sanitary problems for which the present provisions are inadequate. The absence of structural arrangements for delivery can only be

compensated for by excellent administrative skill and oversight of cruder methods. Until this is reached, it is hoped the city may continue to realize its boasted salubrity. But with a great present and a hopeful future, it cannot afford to run risks which two or three English coast resorts on the sand did run and received the results.

VINELAND.

(Examined April 18th, 1882.) Vineland is a beautiful borough, in the township of Landis, Cumberland Co. The township has six thousand inhabitants. Although not on the sea, it is a favorite resort. Dependence for water-supply is upon wells, from twenty to thirty feet deep. The natural springs and water-bearing strata give a good quality of water. As it is not easy to secure any other water-supply except by cisterns, it is very important that the soil be kept free of all organic matter. Cesspools and privy-wells are too common. The cellars are, some of them, damp, notwithstanding the natural dryness of the soil. Many of the houses and stores are very close to the ground, so as not to give facilities for the ventilation of cellars.

The High School building is, in many respects, a model, and much attention is given to its sanitary condition. We visited a shoe and hat factory, in which there was evident effort to secure sanitary advantages for the workmen.

The borough, for riddance of all refuse, both liquid and solid of all kinds, stands much in need of a complete system under exact sanitary police. We think too much has not been said of the many advantages of Vineland. But we also think that until public opinion supports an efficient Health Board, and consents that all cesspools and privy-vaults, and their mode of emptying be regulated by some law, and put under the oversight of a sanitary inspector, the town will not, infrequently, have wells affected by organic matter, and the air of some of the houses not be as pure as it should be. Wells should be properly made, the upper parts cemented and raised above the ground, so that there should be no surface drainage toward them, and then the ground should be kept clean. This means that no refuse should be placed deeply in it, or be long heaped upon it, or be let to run into open cesspools, but rather that all offaling should be so distributed as quickly to aid plants, or else be carried away for more extended irrigation or composting. Since the examination made by the Board, public spirit has been greatly aroused, and no city of its size is more fully

comprehending or urging on requisite sanitary arrangements. We next pass to the more northern and eastern coast of the State, as next to the sea resorts already noticed, the most populous district.

The examination of the region known as the Highlands, so far as it is being largely occupied, shows the importance of taking full advantage of sanitary science and art before there is more rapid increase of population. In much of the excavation and filling up, there is need of close study of drainage. Already, some malaria has developed which is not natural to the locality. We have visited three of the localities to the north of the Hotel Bellevue—but, as they are comparatively new as summer resorts, we leave details as to them for a future report. As to all localities that are fronting the Sandy Hook peninsula, the owners should early settle as to permanent sources of water-supply, and the methods for delivery of sewage. The present use of Shrewsbury river as an open sewer-main, or the interposing of cesspools for occasional emptying into it, may not, as yet, affect the air or the stream. But close engineering and sanitary examination as to its capacity, its flow, its deposits, and its availability, present and prospective, should not be delayed. This is much better than false security on the one hand, or than those wild and denunciatory sanitary booms which break forth sometimes from a very little occasion by way of New York or Philadelphia. The vicinity of the Hotel Bellevue, while offering many advantages, illustrates how various hotels and localities near by must settle this question. As in another article we notice the outbreak of fever last summer at this point, we need not dwell upon it here.

Sea Bright, as a favorite locality near this, has already the water-supply of Long Branch. Many of the hotels and private cottages have appreciated the importance of early sewage delivery, or where compelled to use some form of cesspool have closely examined into methods. Much attention has also been given to adequate house plumbing. But the want of system of close house-to-house inspection each spring and fall by a local Board of Health, or by an approved expert, and the tendency there is to use cesspools, and to adopt devices sometimes more original than competent, needs to be carefully watched. Here, as elsewhere, it is the right of all those who stop at large hotels or summer boarding-places to have the sanitary conditions duly certified by something more than the earnest, and often honest but mistaken assurance of the proprietor. The same legislation which in cities, marks tenement-houses and emigrant-houses extra-hazardous, and passes

special laws as to them, should not overlook these public houses which crowd with inmates, and have often better facilities for reception than they have for the safe delivery of all contents. In all places where no sewer system has been adopted, it seems to us that the regulation of house sewage and all closets should be committed to a responsible local government, which should secure all necessary uniformity and insure healthful methods. While there has been much unintelligent assertion as to insanitary conditions, there is, and always will be, need of constant supervision in order to preserve for this coast its well-known salubrity.

LONG BRANCH.

The soil of Long Branch is mostly of clay, gravel and sand in successive layers. The general contour of the land is favorable to drainage, to which, however, little attention has been given. Not far to the rear of the sea-front there is a depression or small valley, through which a natural brook runs. Not only should this be kept entirely clear of all possible pollution, but in places the ground immediately adjacent to it should be drained and filled in. Instead of this there have been here and there removals of ground, so as to increase the overflow. Here, as in other seaside resorts, there is need of caution as to the causation of malarial disease by the careless handling of the earth in embankment, etc., and by imperfect drainage or the ponding of water at locations where there are no indications for artificial ponds. All local Boards of Health should have in thought and plan these questions, which are deeper and broader and more essential than to find out some special nuisance. It is for this reason that sanitary maps are very desirable which shall show the character of the soil, the natural water-courses, water-sheds and ponds, which shall note and record all underground structures, and show not only contour and topography, but in covered structures give the depths, gradients and other varied information such as is needful where questions of improvement or as to drainage, sewerage or structural conditions may arise. No place on the shore should be without a complete sanitary and contour map.

Water-supply. The general depth of wells is from ten to twenty feet, the water in some being soft, in others hard. Long Branch, however, has what seems a good water-supply from a brook about two miles distant, the water being raised to a reservoir and from thence distributed to the hotels and to most of the cottages. This fortunately

insures the people against the drinking of soil contaminations. It is not, however, so abundant as to warrant a supply for too many adjacent places.

Sewerage. Long Branch has as yet no system of sewerage. As a consequence, the cesspool system largely prevails. The methods are under the control of individual owners, except where the Board of Health has occasion to make complaint. The consequence is that the provisions are good, poor, bad or outrageous according to the conceptions of proprietors. In one case we found an ingenious device by which all slop-water is pumped up from a close tank daily, and flows by proper pipes to an iron perforated box several hundred feet out to sea. The plan seems thus far successful. The fecal refuse is voided in dry vaults, in which sand is plentifully used twice per day.

The garbage runs down a shoot into a brick white-washed vault, where it is received in a wagon and carted away. The whole plan is that of daily removal of everything except the privy deposit. This is treated on the earth-closet system on a large scale. At this hotel the remains of abandoned cesspools were both instructive and comforting.

Here and there, along the shore we found cesspools for filth storage of all kinds and degrees as to locality, numbers, and size. In one case, four in a row beginning near the house, and one receiving the overflow of another, while all allowed soakage into the ground. Three privy wells in succession did the same thing. In another case, the chief privy cesspool was only a few feet from the closets and the overflow cesspool a little further off. We saw one after another of these cesspools varying in degree and in badness according to the inventive arts of various proprietors. Most of them were of brick or of plank, and all provided for soakage. The boast of the landlords always was, that they are cleansed before hotels open each season, and that they are well covered during all the summer. Intermediate ventilation between those slop-ponds and the indoor arrangements was found to be the exception—pan-closets were used in most of the buildings. While we can conceive that under excellent management, these cesspools may be prevented from causing an outbreak of disease, and may be tolerated, yet we were glad to find many of the proprietors urging upon us the advocacy of a water-carriage sewer system. The time has passed when the leaky cesspool for towns and hotels system can be sustained. A sewer system is greatly needed at Long Branch, and, until provided, it is greatly to the interest of those who entertain summer visitors to provide a method of riddance similar to that to which we have at first referred. We are glad to know that the people

are aroused, and that the risks of last summer will not be repeated. Until some general system is adopted and a sewer system fully adequate and properly built is provided, there will be all the differences which individual management can devise. West End was found in its arrangements entirely similar.

No examination has yet been made of Elberon. Its relations of soil and water-supply are much the same, and its proprietors seem determined to secure for it the best sanitary advantages.

ASBURY PARK.

Asbury Park is located on a sandy soil, " with an underlying stratum of clay varying from seven to fifteen feet beneath the surface. The clay-bed is from three to seven feet in thickness, and is underlaid by a stratum of gravel." Ten years ago it was woodland, the forest being of pine and oak. It varies from a population of two thousand in winter to twenty thousand or more in summer. This fluctuation has great advantages and disadvantages, since it gives opportunity for important changes a part of the year, and by the sudden influx often causes evils that may be only in part incident to the locality.

The city ought not to thrive without a perfect system of sewerage and water-supply, and a method of sanitary inspection thorough and frequent. It has the advantage that it is largely controlled by a gentleman who is active and powerful in its sanitary interests, and by a Board of Health which secures sanitary administration. Its sewer system, now embracing over nine miles of pipe, discharges, by means of an intermittent tank, at a proper point into the ocean, and is flushed by waters from the lake. It needs close attention as to grade, and flush, and ventilation, but most needs a more universal connection of all permanent buildings with it. Strict ordinances are adopted and enforced as to the construction of privy-vaults where allowed, and cesspools are discouraged. The overflow of these vaults is into the sewer system. Deep drainage is being looked after at needed points. Surface refuse is looked closely after. Yet, such places cannot be too much impressed that summer success depends on such active, sanitary policing as prevents any accumulation of filth.

Wells are still depended upon, but it is expected that a water-supply will be speedily secured. Water from the soil cannot be permanently depended upon here. In the excavations and changes taking places the need of additional drainage cannot be overlooked, especially as holes or ponds are often made by careless removal of ground. It

is hopeful that its future is recognized as demanding important improvements.

One of its Health Board has recently said that if not another building should be erected for the next year, and the time be spent in putting all the property in the borough in perfect sanitary order, it would be a profitable investment for the future.

OCEAN GROVE.

Ocean Grove depends, for its water supply, on driven wells and lake-water. Like some of the other coast cities, it will need, in the near future, some other form of supply. It has a sewer system which delivers into ill-constructed tanks, but, before another season, some changes will probably be made.

The system of water-closet disposal is varied, and depends too much upon the will of each family, except where the nuisance becomes flagrant. The town should ultimately adopt either a public system of weekly dry removal, or connect all closets, both indoor and out, with a sewer system.

Ocean Grove is so much a camping-place for the summer, that to the parts thus occupied the strict rules of military sanitary police should be applied and executed by an inspector constantly on duty.

The system of garbage hogsheads in the form of cesspools should be entirely broken up.

Both examination and reliable testimony of residents and sojourners have satisfied us too much deference is paid to piecemeal plans and suggestions by those who, although very able in their respective callings, are not to be relied on in either sanitary construction or advisement. We expect to see this excellent location improving rapidly in sanitary methods and discipline, as well as in numerical prosperity.

Ocean Beach depends on driven wells for its water-supply, some of which are good and some of them poor. It has no sewers and its cesspool systems are objectionable. This fine locality ought, by sanitary improvements and administration, to be placed on a sanitary basis. At present every man doeth what is right in his own eyes.

New Brighton has not as yet developed any adequate system.

Spring Lake receives its water supply from the lake, which is a natural one, and which is carefully guarded from contamination. It is much superior to most of the seaside lakes, but it remains to be seen whether it will be sufficient and unexceptionable as there is increase and closer proximity of buildings. Most of our seaside resorts greatly

err in that all questions of water connection, sewage, etc., are not, from the start, regulated by ordinance. There are a few wells in use. The principal hotel carries its slop-water and liquid refuse by pipes to an inlet from the sea, where it has a satisfactory discharge. The privy vaults are well managed on a dry-closet system, the vault being high and easily accessible for the addition of dry earth or for removal. Some of the cottages depend on cesspools. It would not be difficult to arrange a system which would include all present buildings and serve as a plan for future additions.

Sea Girt. The soil is clay, gravel, clay and sand in successive layers. That part of the place nearest the Tremont Hotel depends upon driven wells about twenty feet deep and the water seems to be of an excellent quality.

The hotel has a combined privy and slop-water system with discharges into a wooden tank so carried out to the sea as to be satisfactory. The reliance for internal ventilation is upon a chimney. Most of the cottages depend upon cement vaults and dry removal, and upon cesspools for slop disposal. While we do not find any positive sources of evil at present, yet we do find want of uniformity of administration and absence of structural arrangements such as the patronizing public will ere long demand. The time is not far distant when it will not be sufficient for a proprietor to show his own admirable, unique and original contrivance, or for an association to pass rules and leave the administration to each owner. We were glad to find just one large establishment which had the whole building subjected to sanitary examination each year, in order to insure the perfect repair of every fixture and skilled examination of every contrivance. That part of Sea Girt represented by the Beach House has a natural well twenty-five feet deep of good water-supply.

The water-closet and slop systems are united and carried off by glazed pipes with intervening man-holes, in which there is a small settling basin and a trap made by the mode of inflow and exit. The waste goes finally to a distant wooden cesspool in the sand, designed to allow the liquid to soak away into the ground at a long distance from any dwelling. The plan answers well where there is only one building under good administration. Cottages are compelled to depend on systems of their own. The sewage was formerly carried into a stream, but those in the neighborhood of Squan raised such objections as to lead to the distant cesspool system. We found good fire escapes here, in which some of the hotels are very deficient.

Point Pleasant was not closely examined, but information as to its water-supply and sewerage shows it to be of much the same character as that of Bay Head.

Bay Head. The soil here is more largely sand than in the vicinity of Spring Lake. As the town extends, much salt meadow will be covered and its proper drainage should precede this. The present dependence for water-supply is upon cisterns or driven wells, which vary much in depth and quality.

The association controls the kind of privy-vaults and secures regular removal. The slop-water disposal depends upon cesspools. Here, too, there are important sanitary questions to be settled, to which expert attention is already being given.

In all these towns where no sewer system prevails, all depends upon a general system of ordinances, and their enforcement under the direction of a competent and honest sanitary inspector.

After a careful examination of some of the most prominent of our seaside resorts, we do not find sufficient ground for many of the extravagant and sensational reports which have been made. We do see many defects, but generally just such as are to be found in every summer resort which has grown into such rapid prominence as to lead to careless construction and arrangements. The most discouraging cases have been those where a local Health Board is unwilling to recognize real defects, and hopes to cover up negligence by boasting. A single year of adequate sanitary work, would place these resorts upon such a sanitary footing as a proper vigilance could easily maintain. Much defect arises from bad housekeeping, for which the keepers of hotels and boarding-houses are responsible. Buildings are not put in sanitary order as they should be at the close of each season. The thorough fall house-cleaning is often omitted, and the landlords either shut up all but their own apartments, or haste away with the boarders. Cesspools and outbuildings are left to be emptied just before the opening of the next season. All this work should be done in October or November, and only the necessary remainder be left for repetition in the spring. Visits made by us in April and May fully exposed some of these errors. If the advice of this board is heeded, as we believe it will be, the condition of our sea-side resorts will be greatly improved before another season, and our State as well as the especial localities share the benefit of a large influx of visitors, many of whom become permanently identified with the interests of the State.

SANITARY INSTRUCTIONS IN SCHOOLS.

Report of a Committee of the N. J. State Board of Health.

LABAN DENNIS, M. D., Chairman. FRANKLIN GAUNTT, M. D., EZRA M. HUNT, M. D.

In pursuance of a plan agreed upon by the State Board of Health, for securing in the public schools throughout the State, more adequate attention to instruction in physiology, hygiene, and sanitary science, with reference to the ultimate health and well-being of all the children and youth, and so, finally, of the whole population of the State, Drs. Dennis, Gauntt and Hunt were appointed a committee to look after this subject, and press it upon the attention of the authorities in charge of the educational affairs of the State.

The committee issued the following circular:

CIRCULAR AS TO SANITARY INSTRUCTION AND TRAINING IN SCHOOLS.

At its last session, the Legislature of the State of New Jersey, in Chap. CLXV., Sec. 2, enacted the following provision:

And be it enacted, That the State Board of Health shall be directed to confer with the trustees of the State Normal School as to definite instruction to be given in the practical care of the health of teachers and pupils, and as to provisions for such instruction.

At a meeting of the New Jersey State Board of Health, held at Trenton, the subscribers to this circular were appointed a committee to endeavor to secure in the public schools of this State such instruction in physiology, hygiene, and sanitary science and practice as shall most efficiently carry out the objects for which the Board was established, viz., the health, the happiness, and the prosperity of the people of the State. To this end, we appeal most earnestly to all who are interested in the educational work of this State. State and local Boards of Education, trustees of the State Normal School, of colleges, academies, seminaries, and of local districts, State, county, and city superintend-

ents, principal, and teachers in all our institutions of learning, are asked to consider most seriously, and aid most effectually in instituting and carrying out a scheme for such instruction as we have indicated.

We would call your attention to the fact that the primary object of the public school system of the State is to secure good citizenship. There can be no complete citizenship without a knowledge of and obedience to the laws of one's own being and the laws of society—civil, sanitary, and social. With these, it is safe to say, we shall secure among all classes of the community the best health, the highest productivity—moral, intellectual, and physical—and the greatest amount of well-being and happiness. We would remind you that, hitherto, the laws of one's own being and those of communities, constituting the great body of facts known as hygiene and sanitary science, have been very much neglected in the usual course of public instruction in this State. Thus the young have been permitted to grow up exposed to all the dangers to life and health which follow inevitably the disobedience of Nature's laws.

Is it not practicable that some of the time now spent in teaching branches of knowledge indirectly or remotely serviceable to the learner, might, more profitably to the pupil and to the State, be devoted to imparting such knowledge as must needs be practically useful every day and hour of one's life?

Is it not equally evident that the kind of knowledge which contributes directly to the maintenance of health and vigor of body and mind, the prolongation of life, and the fullest development of all the faculties in a complete and perfect manhood and womanhood, must be second in importance to none other?

If this be true, is it not equally clear that instruction in such should be as systematically and thoroughly given in all grades of schools, as upon any other subject? Admit these propositions and you will agree that we need to modify, as speedily as possible, our scheme of education.

It need hardly be said that the change, to be effectual, must be radical. Teachers must be, themselves, taught. Should not the Normal School begin this work soon and thoroughly? Teachers' Institutes should make it a prominent part of each meeting. State, county, and city Superintendents should unitedly bring to bear all their influence to secure it a place in the regular course of study in the schools under their charge, and to stimulate the teachers to give their best efforts to make it as thoroughly practical as it will be intensely interesting when

properly pursued. Boards of trustees, upon whom now devolves the duty of determining the studies to be pursued in their respective districts, should at once take steps to introduce this, the most important of all, into the course, and by faithful oversight see that it is adequately and properly taught. Not by occasional lectures here and there before bodies of teachers, not by bits of advice to pupils on the part of well-meaning and well-informed teachers can this work be properly done, but only by systematic, oral, and text-book instruction, as faithfully and persistently pursued as possible, and adapted to the ages and capacities of the pupils. It need hardly be said that the subject is broad enough and deep enough to engage the profoundest thought of the foremost scientific minds of the world; yet its facts are the facts of every-day life, many of them so simple, so clear, as to be readily taught and practiced.

With this instruction, so adapted to all ages and capacities, we would combine physical exercises, varied, beautiful, and practical, fitted to develop the bodies and strengthen the minds of the growing pupils. Thus they will secure, as the limited time they have been under training will allow, knowledge immediately serviceable in the battle of life, and bodies well fitted to put it to practical use.

The board will cheerfully furnish names of text-books suited to various grades of schools, by means of which a beginning in these subjects may be made, and when once introduced the demand for adequate instruction will, as in England, produce multitudes of works, from which the teacher may select those best suited to inculcate this needful knowledge, and to train pupils in its practice.

Trenton, August 21st, 1882.

L. Dennis,
F. Gauntt,
E. M. Hunt,
Committee.

Copies of this circular, besides being distributed to school officers, were sent with a note soliciting earnest attention thereto on behalf of the committee, to each member of the State Board of Education, the Trustees and Principal of the State Normal School and the State Superintendent of Public Schools.

In order to be able to answer more fully and intelligently inquiries as to text-books and other apparatus suitable for carrying on this work, the circular note herewith appended was addressed to all the prominent educational publishers in this country advertising works

on anatomy, physiology, hygiene, sanitary science and gymnastics for schools.

GENTLEMEN—The committee of the State Board of Health issuing the accompanying circular, desire to call your attention to the last paragraph thereof, and would be pleased to examine specimen copies of your publications on physiology, hygiene, gymnastics and sanitary science for schools, with reference to a recommendation of the best for use throughout the State.

Yours respectfully,

L. DENNIS,

Chairman.

The responses to this note were very general and entirely satisfactory, as showing liberality on the part of publishers, and a most creditable exhibition of material excellently well suited to all the purposes of instruction in these subjects, from the primary school to the college. A classified list of those received is herewith given, with the name of the author and publisher, and a very brief mention of some of the points of value in each. We have examined likewise a number of English works the text of which is often excellent, having been used in some cases as the basis of our own. In fullness and perfection of illustrations our publishers take first rank. Special mention should be made of the work of Mrs. Charles Bray, "Physiology for Schools," published by Longmans, Green & Co., London, as a very readable and instructive book for teachers of primary classes.

ANATOMY, PHYSIOLOGY, AND HYGIENE.

PUBLISHER.	TITLE.	AUTHOR.	REMARKS.
Am. School Book Co., St. Louis	First Lessons in Physiology	C. L. Hotze	A good work for beginners.
D. Appleton & Co., N. Y.	Physiology	M. Foster	A science primer to be read to beginners.
" " "	Physiology and Hygiene	T. H. Huxley and W. J. Youmans.	A most excellent book for students somewhat advanced,
Clark & Maynard, N. Y.	" "	J. C. Hutchison	A very suggestive and valuable book.
Eldredge, & Brother, Phila.	Anatomy, Physiology, and Hygiene	J. C. Martindale.	A clearly-expressed, compact work.
J. L. Hammett, Boston	Outline Physiology	A. F. Wood	A summary for children under twelve.
Harper & Brothers, N. Y.	Physiology and Hygiene	J. C. Dalton	An excellent work.
H. C. Lea, Phila.	Anatomy and Physiology	H. Hartshorne	A very good book for advanced students.
J. B. Lippincott & Co., Phila.	Second Book on Anat'y, Physiology, and Hygiene	C. Cutter	Enriched by comparisons with all animal life. Teachers should consult this.
Porter & Coates, Phila.	School Physiology	R. J. Dunglison	Full of good things, clearly expressed and well illustrated.
G. P. Putnam's Sons, N. Y.	Animal Physiology	J. M. Fothergill	A good book for beginners.
" " "	Elements of Animal Physiology	J. Angill	A clear, concise, and serviceable book for middle-grade pupils.
" " "	Animal Physiology	J. Cleland	An admirable work for advanced students.
Sheldon & Co., N. Y.	Hooker's New Physiology	W. Hooker and J. A. Sewall.	Style easy, natural, and attractive.

HYGIENE.

PUBLISHER.	TITLE.	AUTHOR.	REMARKS.
P. Blakiston, Phila.	Healthy Homes	G. Wilson and J. G. Richardson.	Full of excellent material for the teachers and pupils.
" "	Bible Hygiene	A Physician	A summary of the health-hints of the Bible, and other authorities.
" "	School and Industrial Hygiene	D. T. Lincoln	Full of good counsel for teachers.
Macmillan & Co., N. Y.	First Lessons on Health	J. Berners	A manual of simple instruction for the young.
G. P. Putnam's Sons, N. Y.	The Maintenance of Health	J. M. Fothergill	A most valuable work; should be in the hands of many teachers and parents.
P. Blakiston, Phila.	Easy Lessons in Sanitary Science	J. Wilson	A manual of practical hints.
G. P. Putnam's Sons, N. Y.	Hampton Tracts for the People	Various Authors.	Full of excellent advice and instruction.
" " "	First Book of Knowledge	F. Guthrie	A compend of information about materials used in arts and manufactures, incidentally helpful in teaching sanitary science.

GYMNASTICS.

PUBLISHER.	TITLE.	AUTHOR.	REMARKS.
Cowperthwaite & Co., Phila.	Vocal and Physical Training	L. B. Monroe	Particularly adapted for chest and voice culture.
E. Steign & Co., N. Y.	Hand-Book of Calisthenics and Gymnastics	J. M. Watson	A complete manual on elocution and gymnastics, well illustrated and admirable.
" " "	Manual of Calisthenics	"	Selected from the above.
Van Antwerp, Bragg & Co., Cin.	Manual of Free Gymnastic and Dumb Bell Exercises	J. H. Smart	Well adapted for beginners.

SECRETARY'S SUMMARY OF REPORTS

FROM LOCAL BOARDS OF HEALTH, WITH EXTRACTS AND COMMENTS.

The following townships and cities have either in this or previous years notified us of the formation of local Boards of Health under the law of 1880, or its supplements.

ATLANTIC COUNTY.

Absecon, Atlantic City, Buena Vista, Egg Harbor City, Egg Harbor Township, Galloway, Hamilton, Hammonton, Mullica and Weymouth.

BERGEN COUNTY.

Englewood, New Barbadoes, Saddle River, Lodi, Palisade, Union, Midland, Ridgewood and Washington.

BURLINGTON COUNTY.

Beverly City, Bordentown, Burlington City, Chester, Chesterfield, Cinnaminson, Easthampton, Evesham, Little Egg Harbor, Lumberton, Mansfield, New Hanover, Northampton, Pemberton, Randolph, Southampton, Springfield and Washington.

CAMDEN COUNTY.

Camden, Centre, Delaware, Gloucester Township, Gloucester City, Haddon, Merchantville Borough, Stockton and Winslow.

CAPE MAY COUNTY.

Cape May City, Cape May Point, Lower, Middle and Upper Townships.

CUMBERLAND COUNTY.

Bridgeton, Deerfield, Fairfield, Greenwich, Hopewell, Landis, Maurice River, Millville, Stoe Creek and Vineland.

ESSEX COUNTY.

Belleville, Bloomfield, Caldwell, Clinton, East Orange, Franklin, Livingston, Millburn, Montclair, Newark, Orange, South Orange and West Orange.

GLOUCESTER COUNTY.

Clayton, Franklin, Greenwich, Glassboro, Harrison, Mantua, Monroe, West Deptford, Woodbury and Woolwich.

HUDSON COUNTY.

Bayonne, Harrison, Hoboken, Jersey City, Kearny, North Bergen, Town of Union, Union, Weehawken and West Hoboken.*

HUNTERDON COUNTY.

Delaware, East Amwell, Franklin, Frenchtown Borough, High Bridge, Holland, Kingwood, Lambertville, Lebanon, Raritan, Readington, Tewksbury, Town of Clinton, Union and West Amwell.

MERCER COUNTY.

Chambersburg, East Windsor, Ewing, Hamilton, Hopewell, Lawrence, Princeton, Trenton, Washington and West Windsor.

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*Note.—The Hudson County Board of Health has general jurisdiction, and these *are only auxiliary* thereto.

MIDDLESEX COUNTY.

Cranbury, East Brunswick, Monroe, New Brunswick, North Brunswick, Perth Amboy, Piscataway, Raritan, Sayerville, South Amboy, South Brunswick and Woodbridge.

MONMOUTH COUNTY.

Asbury Park, Eatontown, Freehold Township, Town of Freehold, Holmdel, Howell, Manalapan, Marlboro, Matawan, Millstone, Neptune, Ocean, Ocean Grove, Raritan, Keyport, Shrewsbury, Red Bank, Upper Freehold, Wall and Manasquan.

MORRIS COUNTY.

Boonton, Chatham, Chester, Dover City, Jefferson, Mendham, Morris Township, Morristown, Mount Olive, Passaic, Pequannock, Randolph, Rockaway, Roxbury and Washington.

OCEAN COUNTY.

Berkeley, Eagleswood, Jackson, Lacey, Plumsted and Stafford.

PASSAIC COUNTY.

Acquackanonck, Manchester, Passaic, Paterson, Pompton, Wayne and West Milford.

SALEM COUNTY.

Lower Alloway's Creek, Lower Penn's Neck, Mannington, Pilesgrove, Quinton, Salem City, Upper Penn's Neck, and Upper Pittsgrove.

SOMERSET COUNTY.

Bedminster, Branchburg, Bridgewater, Franklin, Hillsborough, Montgomery, North Plainfield and Warren.

SUSSEX COUNTY.

Andover, Byram, Frankford, Greene Hardyston, Montague, Newton, Sandyston, Sparta, Stillwater, Vernon and Wantage.

UNION COUNTY.

Clark, Cranford, Elizabeth, Fanwood, Linden, New Providence, Plainfield, Rahway, Springfield, Summit, Union and Westfield.

WARREN COUNTY.

Allamuchy, Belvidere, Franklin, Frelinghuysen, Greenwich, Hackettstown, Hardwick, Harmony, Knowlton, Lopatcong, Mansfield, Oxford, Phillipsburg, Town of Washington and Washington.

All of these are organized under the more recent laws, except Camden, Newark and Plainfield, which make report, but still act under their respective charters.

We thus have had, in all, reports from two hundred and thirty-one local Boards of Health, which, although differing much as to their efficiency and as to their reports, have done much in the care of the public health.

The few townships that have not formally organized, should remember that, in case of any nuisance or any sudden outbreak of disease, the citizens will have ground of complaint, if there has not been such organization as will admit of ready service. Although in townships, each new township committee does not need to re-organize in form, there should, at least four times a year, at regular meetings, be inquiry as to health matters and attention to special causes for action, as may be needed. Those townships which have not formally organized their Health Boards, nevertheless, can be compelled to act as such under Chap. CLV., Sec. 3, 1880:

3. *And be it enacted*, That in each township of the State outside of city limits, the township committee, together with the assessor and the township physician, if there be such an officer, shall constitute the Board of Health for all of said township outside of any city limits, and shall have the same powers as are possessed by any city Board of Health within the State, so far as they could relate to any unincorporated district.

The following suggestions are made to local Health Boards:

SUGGESTIONS TO HEALTH BOARDS.

In addition to other directions, to be found in this and other yearly reports of the State Board, it may be added—

I. Let each township committee, at its usual meetings, when the assessor is present, sit also as a Health Board and enter the fact in the township health book, together with any item of business.

II. Whenever new officers are elected, there should, at the first meeting, be an entry in the health book of the names of the Health Board as thus made.

III. Where there is no township physician as a member of the Board, some of the Boards have invited some adjoining physician to act as their adviser, but it is better to elect a medical member.

IV. Carefully examine all laws relating to the construction of local Boards and their duties. Correctness and promptness of action are most important. The failure of a law is oftener in delay or mistakes in its administration, or in technical errors, than in the defects of the law.

V. The reports of the State Board of Health, as sent, are not the property of individuals, but of the Board. The keeper of the town health book should keep control over them, and see that when loaned to others, they are returned to him, and passed over into the hands of the succeeding officer.

VI. We ask the same promptness in future annual reports as in these, and that the few who have failed to organize, or to make full report, will fully arrange at the first meeting of the township committee, and notify us.

VII. As the returns of marriages, births and deaths so much indicate the progress and health of communities, and are essential in the study of local conditions, all Boards should insist upon prompt returns, and report to the Secretary of State any omissions. It is, too, the legal right of every citizen to have such a record. Any neglecting returns are liable to suit at law.

VIII. All communications should be addressed "State Board of Health," or "Bureau of State Vital Statistics," State House, Trenton.

IX. You need carefully to consult the references contained in this report to laws, circulars, etc. While the supplement of 1881, Chap. CLV., does not repeal any part of Chap. CLV., Laws of 1880, yet as Sec. 5 more closely defines the methods of summary proceeding, it is best for city and borough Boards of Health, and also may be well for township,

to adopt ordinances in accord with the supplement and publish the same. And it is always at the option of a Board of Health and a question of advisement whether to proceed by complaint before a grand jury and by the common law as to nuisances, or by seeking injunction, or under special acts. When the nuisance is of such immediate peril as to require summary abatement, these special laws are directly applicable.

See, also, Circular XXI., Fifth Report (1881), pages 184–188.

We do not need, this year, to repeat the names of all Boards which have reported, but shall make a summary or selection only from such as refer to points of especial public interest. In some cases, for brevity, only the substance of the report is given and not the exact language.

ATLANTIC COUNTY.

ATLANTIC CITY. - *Report from* THOMAS MCGUIRE, *Secretary.*

The water-supply is chiefly by cisterns, although we have an abundance of water introduced from the mainland.

The drainage is done chiefly by eight sewers, running across the city and emptying into a drain on the meadows, provided for that purpose. Council is now preparing to build one or more sewers of brick and stone clean across the city. The low lots are being filled up to city grade.

We continue to dispose of our garbage and effete matter the same as last year, viz., by shipping it to the farms on the mainland. The most important function of the Board of Health is that concerned in the investigation and suppression of nuisances, which come under their notice frequently, many of which are of a complicated nature, involving patient investigation and assiduous care in their management. The time has arrived for energetic measures, and the city government and property-owners feel their responsibility; the city government has made liberal appropriations for the improvement of streets and sidewalks; the property-owners are paying more attention to, and are busily engaged in, filling to grade low lots. More attention is being paid to drainage, and, if things go on as commenced, I am satisfied that there will be great improvement in this city and surroundings by another year. There does not seem, nor has there been during the season, any prevalent disease. We have had but few deaths since my last report. We have not only good water in our cisterns, but an abundant supply of good and pure water from the mainland, which is a great convenience and a protection against fire.

HAMILTON. - *Report from* D. B. INGERSOLL, M. D., *May's Landing.*

The report complains that, while the law as to vital statistics is well complied with, physicians are not accurate enough in stating the cause of death. Also, that there is need of a more stringent law regulating practice, so that only those who are regularly graduated shall practice, and mere time of practice shall not be a test.

The report adds, We would also call your attention to the fact that the law requires the Board of Health to abate nuisances, without giving them the means to do it. Thus, if it notify the owners of land to abate a nuisance detrimental to the health of the people, or they will proceed to do so and charge to owner, where will the pay come from, if the owner refuses to pay? or where can we procure funds to conduct a suit for damages? We think some legislation in this direction is called for.

We cannot but again call your attention to the evil to the youth of our land, and we may truly say the growing evil, because of the use of tobacco in its various forms, entailing, as it does, upon the future men and women all the terrible consequences of this habit. We think that legislation should be recommended by the State Board of Health to prohibit its use or sale to those under a certain age.

Other reports of the county note no special defects and no unusual sickness.

BERGEN COUNTY.

ENGLEWOOD. - - - *Report from* J. W. TERRY, M. D.

There can be no doubt that the malarial diseases prevalent in the lower parts of the town are largely, if not exclusively, due to the low, imperfectly drained meadow-land lying by the side of the railroad, and extending to the Hackensack river, and known as "the swamp." A dam across the mouth of Overpeck creek seriously interferes with the natural drainage of these meadows, as also does the railway embankment with the low lands lying directly to the east of it. A petition, signed by a large number of prominent citizens, is now before the Court of Common Pleas for Bergen county, asking for the drainage of these meadows, under the provision of the State law of 1881.

There is no general system of sewerage in Englewood, although there are a few lines which give relief to a few localities—the principal one, about two thousand feet long, runs from the corner of Engle

street and Palisade avenue, through the latter street to William street, and thence to Overpeck creek at the Englewood avenue crossing. The prime necessity, however, without which little can be done in the way of sewerage, is a main sewer or canal, to serve as an outlet from the town to tide-water, and into which all lesser sewers can empty.

SADDLE RIVER. - *Report from* JOHN E. KIPP, *Dundee Lake.*

The report notices a much less prevalence of malaria than the previous year.

UNION. - - *Report from* G. K. ALYEA, *Rutherford, N. J.*

Have had but one case of small-pox, provided for by the Board of Health. Every person willing to submit has been vaccinated. There was vaccination of children, by order of the Board. The spread of small-pox, during last winter, was no doubt checked by this timely provision. Only three persons died.

BURLINGTON COUNTY.

CHESTER. - - *Report from* WM. NEWTON STOKES, M. D.

The report notices a decline in the malarial fevers which had occurred during a former year, although many cases had occurred in adjoining townships near the river. Moorestown, both because of its porous and absorbent soil and its high elevation, had good drainage and usually excellent healthfulness.

CAPE MAY COUNTY.

CAPE MAY CITY. - *Report from* C. S. MAGRATH, *Cape May.*

In relation to drainage and sewerage: Much has been done the past year towards perfecting the drainage facilities of the Island, and about $15,000 have been expended by the corporation alone. The defects of sufficient fall in some cases have been remedied, and in others, sewer-mains have been enlarged and extended. A few cases of sickness, traceable to the defects in the sewerage and undrained area under one of the large hotels, have been reported, and measures at

once adopted for remedying the same. The prevalence of malaria, which has attracted so much of public attention to our summer resorts, has, by no means, been strikingly noticeable here, the total number of cases reported not exceeding half a dozen.

(As the water-supply and sewer-system is described in another connection, we do not need to quote the rest of the report.)

MIDDLE. - - - *Report from* S. H. TOWNSEND, *Sec'y.*

The only nuisance reported to the Board was the county jail, situated at court-house. The ventilation from the privy became clogged, and the four inmates became sick or nearly so. The chairman of the Board notified the committee on public buildings (freeholders) to have it attended to immediately, which was done, and now it is all right.

CAMDEN COUNTY.

CENTRE. - - - *Report from* F. E. WILLIAMS, M. D.

Malarial fever is noticed as having been somewhat in excess the last year.

HADDON. - - *Report from* J. STOKES COLES, *Haddonfield.*

There is a custom quite generally followed by persons building new houses in Haddonfield, of having stationary wash-stands and water-closets in their houses, which, together with the pump-trough, drain into wells from twenty to sixty feet from the house; the privies also have wells. As our drinking water is derived almost entirely from wells, there will surely be trouble in the course of time, unless people are *compelled* to have *cemented* sinks which can be emptied as occasion requires. So far the drinking water of Haddonfield has been excellent.

GLOUCESTER.—There has been an unusual prevalence of malaria in this township, especially in the vicinity of some stagnant ponds.

CUMBERLAND COUNTY.

FAIRFIELD. - - - *Report from* DR. S. M. SNYDER.

An extended account is given of an outbreak of typhoid fever affecting four members of one family, the first occurring in a girl who

was first sick two weeks in Camden. No local cause is known, and it is claimed that the family had before shown a strange predisposition to fever.

ESSEX COUNTY.

BLOOMFIELD. - - - *Report from* J. K. OAKES, *Sec'y.*

The prevailing diseases are the various forms of malaria from July 1st, 1881, to July 1st, 1882. No especial sickness from July 1st, 1882, to date. Whilst making the above statement of diseases we consider our town more healthy and less subject to malarial fever than some of our neighboring towns in this county.

We are expecting next year to have the aid of an association recently formed for the improvement of the town, who, by making suggestions and counseling with the Board, may help us in the abatement of nuisances and thus improve the health of the place.

EAST ORANGE. - - - *Report from* JOHN L. ROBERTS.

There is no public drainage system. The Waring system is used in some private places, which seems to work satisfactory. Brooks are not used for sewage matter, but once in a while we catch a pipe running in and stop it.

MILLBURN. - - - *Report from* ISAIAH WILLIAMS.

There have been some complaints from individuals against what is called Condit's pond, also the head-waters of what is called Factory pond. Dr. Whittingham sent a communication in reference to the former to the Board of Health, but three members refused to organize as a Board of Health in order to consider it. There has been no meeting of the Board of Health this year. Cause, as above. I make this sinple statement because I look upon it as a duty.

It is the purpose of our neighbors, Springfield township, to endeavor to have a law passed at the next session to abolish Factory pond—straighten and widen parts of the Rahway river. This is an improvement I endeavored to interest the people in over ten years ago. It is without question a matter of very great importance to the health of a large district, embracing a part of three townships.

ORANGE, - - *Report from* T. W. HARVEY, M. D.

The Board of Health for the current year is constituted as follows: Geo. H. Hartford, Mayor; Aldermen, Wm. Wang, Chairman, Christopher M'Cullough, James Young; Wm. M'Chesney, Health Inspector; Thos. W. Harvey, M. D., City Physician and Secretary.

The Board of Health have little to add to the report of last year. The regular inspections have been made as usual; every year less difficulty is met with in persuading citizens to keep their premises in order.

We have had our usual difficulties with the small brooks running through the town; although the discontinuance of the use of the brooks as sewers for cesspools and vaults has ameliorated their condition to some extent, they still receive a great deal of refuse that cannot be prevented from flowing into them until there is provided an efficient sewerage system.

The water-supply question is rapidly approaching solution. There has been organized a Water Board, which has given out the contracts for the city, and for making the necessary reservoirs, &c.

The source of supply is the west branch of the Rahway river. The water is to be taken at a point where the supply from a water-shed of five square miles can be collected in a large reservoir. The water is to be conducted by iron pipes around the mountain to the city limits, a distance of six miles, by gravity. The water-shed is one particularly well fitted to supply pure water. The soil is rocky, the land principally used for grazing purposes and thinly populated. The water comes, principally, from the trap-formation, and the stream is free from factories and other nuisance-breeding establishments. The steps that led to the present condition of affairs, are interesting.

In the autumn of 1878, an organization was formed, called the "Citizens' Health Association of the Oranges, Bloomfield, and Montclair." Its objects were, the spreading of information about, and exciting an interest in sanitary reform among the people of this section. Its operations were confined mainly to Orange and East Orange. It lived two years, and when its mission seemed fulfilled, it died. Its work, however, lived after it.

During these two years, it had frequent meetings, and was addressed by many speakers well known in sanitary circles, on the subjects of water-supply, sewerage, and of house sanitation. Its committee on water-supply during its study of this problem, discussed the following sources of supply:

1. That Orange, in common with the other towns, should take its supply from the Passaic at Little Falls.

2. That the city should be supplied by the driven-well system (under the Green patent) from a low part of the town, northeast of the city proper.

3. That shallow wells should be sunk in the same neighborhood, and that a reservoir be formed from whence the water could be pumped to a stand-pipe.

4. The Peckman river, a tributary of the Passaic, between the first and second mountains.

5. The west branch of the Rahway in the same valley. These sources were studied carefully, and propositions were received from engineers for obtaining a supply from some of them. But the minds of the people were not yet awake to the necessity.

In the winter of 1880, the New England Society joined the Health Association in the agitation of the subject. In the summer of 1880, appeared the advertisement of the sale of the charter of an old water company. This attracted the attention of the gentlemen who had been on these committees, and they bought it in, and formed the Orange Water Company. This company now took up the question in a more practical manner, and at the end of a year, presented a proposition to the authorities of Orange and East Orange, to supply them with water from the west branch of the Rahway if the two towns would guarantee a certain income by agreeing to hire a given number of hydrants. If only one town could accept their proposition, they proposed to obtain their supply from wells, until they could afford to go to the Rahway. These propositions created a great deal of discussion, and at a public public meeting held a month or two later, in Orange, it was determined by the town authorities to appoint a committee to see if there were not other sources of supply. This was the first move made by the authorities of Orange, for several years, in the matter of water-supply.

This committee accordingly worked over the same old ground, and in addition it was suggested to them to obtain the water from one of the brooks running down the east side of the mountain. This seemed so feasible and so cheap that the committee reported in favor of it, and the Common Council submitted the question of bonding the town for water works to the people at a special election. Water carried the day.

This gave the city government the first opportunity that they had for spending any money in the investigation of the subject. The

committee again took up the subject, this time with the advice and assistance of capable engineers, and they reported a second time in favor of the present scheme. A Water Board was accordingly organized, the bonds issued, and the matter awaits now the decision of the courts as to the water-rights and privileges.

In East Orange, in the meantime, the proposition of the Water Company has been accepted. They have nearly all their pipes down and expect to pump water through their pipes by the 15th of October. Their source of supply is a series of wells in the eastern part of the township.

During the year the Orange Memorial Hospital completed their new building. It has a capacity of forty beds. The plan is as follows: A brick administration building three stories high. The first floor has committee, consultation, operating and dining-rooms and a pharmacy. On the second floor there is a children's ward, a gynæcological ward, private wards and a matron's room, with bath-room, &c. The third floor is devoted to the nurses and servants and storage, with an available ward if it is needed. Connected with the main building is a two-story wooden pavilion, with a male ward below and a female ward above. This building has a capacity for twenty-six beds. It also has nurses' rooms on each floor and bath-rooms and water-closets, with accident ward on the first floor.

The kitchen is a one-story wooden addition to the main building, connected by a corridor. On the same lot is a dispensary building, a dead-house, a laundry, and an isolated pavilion.

The medical staff consists of eight attending physicians and a non-resident house physician. The nursing is in charge of a trained nurse, under whom are the pupils of the training school recently established in connection with the hospital.

During the last twelve months, many patients have been treated in the hospital, and in the outdoor department.

The chief work accomplished by the Board of Health this year has been the following ordinance:

A further supplement to an ordinance entitled "An ordinance establishing the Board of Health of the town of Orange," approved May twelfth, eighteen hundred and sixty-five.

Be it ordained by the Common Council of the city of Orange, as follows:

1. Every physician, or person acting as such, who shall have any patient, within the limits of said city, sick with scarlet fever or

diphtheria, shall forthwith report the fact to the Health Inspector of the said city, together with the name and age of such patient, and the street and number (or other location) of the house where such patient is being treated; and, in default thereof, shall forfeit and pay twenty dollars for each and every such offence.

Passed July 10th, 1882.

HORACE STETSON, *City Clerk.*

Approved July 12th, 1882.

GEO. H. HARTFORD, *Mayor.*

The following circular was issued:

ORANGE BOARD OF HEALTH, July, 1882.

DR..................................

DEAR SIR—Your attention is respectfully called to the following ordinance, passed at the last meeting of the Common Council:

A further supplement to an ordinance entitled "An ordinance establishing the Board of Health of the town of Orange," approved May twelfth, eighteen hundred and sixty-five.

Be it ordained by the Common Council of the city of Orange, as follows:

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Passed July 10th, 1882.

HORACE STETSON, *City Clerk.*

Approved July 12th, 1882.

GEO. H. HARTFORD, *Mayor.*

When the Health Inspector has received the notice he will notify the Superintendent of Public Schools that the house reported is infected, and that no pupils from the infected house must be allowed to attend school until the house is reported free from disease by the medical man in charge or by the Health Inspector. In this way it is hoped that we may remove one of the most active agencies for the spread of these diseases.

Arrangements will also be made with the teachers of private schools

by which they shall receive information of the existence of these diseases among their pupils.

It is earnestly hoped that the medical profession will assist the Board of Health in their efforts to restrict the spread of these diseases in our midst by sending their reports to the Health Inspector as soon as they have cognizance of any cases of these diseases.

Blanks will be furnished by the Health Inspector upon which to make returns, and may be obtained by application to him by mail.

By order of BOARD OF HEALTH.

During the autumn of 1881 we had a great many fatal cases of diphtheria. During the four months ending December 30th there were twenty-one deaths; since January 1st there have been eleven deaths—most of these occurred during May and June.

From February to August we had scarlet fever prevailing. In many cases there was great malignancy. There were in all thirty-three deaths. It prevailed chiefly in the crowded neighborhoods and on the low grounds where the mechanics and laboring classes live.

Of typhoid fever we had very little, four fatal cases during the year.

Respectfully submitted,

THOS. W. HARVEY, *Sec'y*

SOUTH ORANGE. - - *Report from* A. A. RANSOM, M. D.

Have moved a large dam early in the spring, letting the water in branch of Rahway river flow through and not back up in the village. It was done under the State law.

GLOUCESTER COUNTY.

GLASSBORO. - - - *Report from* JOHN E. PIERCE.

It had eleven cases of small-pox and found it necessary to build a small-pox hospital.

GREENWICH. - - - JOHN STETSON, *Paulsboro.*

The slaughter-house in Paulsboro is situated within one hundred yards of the main street, and is surrounded on all sides by dwellings.

It is in contemplation to thoroughly drain the main street in Paulsboro. There is a marked improvement in the sanitary condition in our township during the past year by the abatement of nuisances under legal notice and inspection.

MONROE. - - *Report from* J. G. EDWARDS, M. D.

The principal diseases are consumption and malaria. The latter was almost unknown till within the last two years, and during last autumn it assumed such alarming form as to cause the local Board of Health to take active measures in sanitary precautions.

Consumption is the most prevalent of all human diseases, and each year it claims its annual holocaust of victims, and its prevalence does not seem to depend upon hereditary influences.

The principal vocations of industry are glass-blowing and sewing. The women engaged in city sewing on their machines suffer from this disease very much more than the males in glass-blowing.

HARRISON. - - *Report from* E. D. DE GROFF, M. D.

The report says there has been an increase of malarial diseases in Harrisonville, although it is not attributed to the mill-pond near by. A nuisance caused by a slaughter-house was, on complaint, abated.

A contagious disease among poultry has proved very fatal.

HUNTERDON COUNTY.

WEST AMWELL. *Report from* GEO. H. LARISON, M. D., *Lambertville.*

The general health has been good, except in one mile of the township which borders on the Delaware river. Here, nearly every one within a third of a mile from it has had chills and fever.

LEBANON. - *Report from* A. T. BANGHART, *Glen Gardner.*

Refuse is very carelessly thrown in the streets and not very far from the dwellings. Excreta is not properly disposed of, and disinfectants not generally used. Privies in the towns of Glen Gardner and Junction are not in as cleanly a condition as could be desired. In both places malaria and typhoid have existed to a greater extent

than ever before. Its cause, considering the high and healthy location of the country, is difficult to ascertain. (!) Complaint has been made that a mill-race running through the town, has been used as a place for depositing refuse and excreta by those residing along its banks. Most of the cases are near it, except at Junction, where physicians are at a loss to give any solution of the problem.

Six cases of typhoid fever occurred near White Hall, in a family named Tiger (farmer); three deaths resulted. Cause was found in the stopping up of a sluice-way running from the house. Near the mill-race spoken of at Glen Gardner, three cases; one death just occurred, two others now convalescing. Some cases of malaria, not considered dangerous, accompanied by chills, now exist. Was very healthy during the summer. The deaths referred to have all arisen since July 30th, but township, generally, has not been so unhealthy as it was during the last year.

EAST AMWELL. - - *Report from* P. C. YOUNG, *Ringoes.*

The report mentions malarial fever as still quite prevalent; also, epidemics of measles and whooping cough and isolated cases of dysentery. Thus, there was considerable sickness, but very few deaths.

KINGWOOD. - - *Report from* H. P. SHAW, *Kingwood.*

Many cases of dysentery are reported.

MERCER COUNTY.

TRENTON. - - - - *Report from* WILLIAM CLOKE.

Since the formation of the new Board under the law of 1880 and 1881, it has successfully carried through one great sanitary improvement of decided importance. A fetid and sluggish bayou of filth, two thousand four hundred feet in length, called Petty's Run, had for years been a reeking pest spot in the northeastern part of the city. The new Board has taken this resolutely in hand and secured its complete abatement. It next proposes to address itself to another part of this same run, west of the canal, which has also been for many years a pestilential and disease-breeding nuisance. The water-power nuisance, consisting of the sewage and filth-polluted raceway of the Trenton Water Power Company, which winds for nearly

a mile through the thickly populated part of south Trenton, has also been taken in hand by the Board with promising results. All those who drain or sewer into this stream have been notified to cease doing so, and those who refuse will be prosecuted. Nearly all who have been notified signify their willingness to comply with the orders of the Board. The Water Power Company itself has been notified to abate the nuisance already existing in its race-way, and it promises promptly to do so.

The Board is very much gratified with the results thus far achieved, and with the cheerful and prompt way in which the citizens comply with the requirements of the code, and try to co-operate with the Board in cleansing and improving the sanitary condition of the city. The Board has not yet taken up the question of sewerage, as that is now being considered by the Common Council, which has appointed a special committee on the subject.

CHAMBERSBURG. - - - *Report from* H. R. HAVEN.

Water is supplied from the city of Trenton water works, but some wells are yet in existence which have been detrimental to health. Some persons owning wells have turned them into cesspools, which has contaminated the water of others. Several cases of typhoid fever have originated from this cause.

Surface drainage is now relied on, but we find that the surface of the borough is so level, that sooner or later, some other system will have to be adopted. Malarial fever has not been as prevalent as last year.

HIGHSTOWN. - - - - *Report from* W. W. SWEET.

The report alludes to the supply of a hotel and of some houses by a spring, cisterns connected therewith being used. Also to some interferences with natural drainage. Eruptive diseases have been remarkably prevalent, such as measles, chicken-pox, and small-pox. The form of the cases of small-pox seems to have been of the hemorrhagic variety, last year noted as occurring at Rahway and Egg Harbor City.

MIDDLESEX COUNTY.

NEW BRUNSWICK. - *Report from* T. L. JANEWAY, M. D.

Only about one-third of the city is sewered, and this system, as stated in last year's report, being constructed on the defective princi-

ple of having its outlet in the slack-water of the Delaware and Raritan canal, is to be considered as more prejudicial than advantageous. Other portions of the city are entirely dependent upon surface drainage, the gutters, the streets, &c.

MONMOUTH COUNTY.

ASBURY PARK. - - *Report from* H. MITCHELL, M. D.

The sewer system in Asbury Park has stood the test of another year, and has served its purpose satisfactorily. Improvements are in progress calculated to make the outlet into the sea more durable, and also to further ventilate the street-pipes.

Garbage has been removed from the borough, and treated, during the past summer, in a manner entirely satisfactory to the Board. Water-tight barrels were substituted for wagon-boxes for the collection and transfer of garbage, and it was carried through the streets without spilling. It was deposited in pits four feet deep and four feet six inches wide, and these covered, daily, with earth. The site selected for depositing the garbage is not near any water-course, and is about three miles from our borough limits.

Excreta is removed with sufficient neatness and decency. It is placed in air-tight barrels, and its removal creates no nuisance in the borough, though the manner in which it is deposited (about two and a half miles from our limits) has caused complaint.

FREEHOLD. - - - *Report from* H. B. COSKILL, M. D.

The report gives interesting details of cases in which vaccination prevented small-pox, and of two cases in which children who were vaccinated two days after the eruption in the case of their father, and who contracted the disease, but had a mild varioloid in consequence of their vaccination.

FREEHOLD BOROUGH, - - *Report from* C. F. RICHARDSON.

The abundance of iron permeating our subsoil does much to render harmless the impurities filtering into water.

The average distance of water-closets from the wells is too small to insure perfect safety, but it is only a question of time when the disinfecting powers of the ground will become materially weakened. In

some few cases kitchen sinks, &c., are connected with outside cesspools, but generally the slops are allowed to wander at will.

During the year the town has been visited by small-pox, six cases in two houses, without fatal results.

Immediately upon the appearance of the first case, a system of house-to-house vaccination was effected by this Board, at the expense of the town, which resulted in the vaccination of about 370 persons, about 245 of whom took successfully, and we believe there is not now a more thoroughly vaccinated town in the State. To this, the faithful care of the attending physicians, and the vigilance of this Board, can be attributed the speedy and complete stamping out of the disease.

The report also contains a statement as to a case of flagrant nuisance which the Board had to abate, and for the six dollars expended, they sued the owner. The case went against the Board on the ground that the plaintiff had not been notified to attend. This and another case are being fully presented to proper legal examination. Unless some technicality embarrasses appeal, the principle involved will soon be tested, or if not in this case, by some other which may arise.

OCEAN GROVE. - - - *Report from* A. E. BALLARD.

There is a system of sewer pipes, reachable from all the main avenues, and extending with the increase of population, made of twelve and fourteen-inch terra cotta, cemented at the joints, emptying into vaults of from forty-eight to sixty feet in length, sixteen to twenty in width and depth, upon the shore, made of plank, with open bottom, covered first with plank and afterward with sand, with ventilating shafts supplied with fire near them, opened usually on Saturday nights, and oftener, if required, and washed out by the sea. No sickness has been attributed to the drainage of sewage—no malarial fevers have originated here. There has been no interference with the natural water-courses, except to give them more perfect outflow into the ocean, and to admit, at will, the ocean into them. The general ideas of the State law as to drainage are carried out, and there is a regular map of the system of sewerage. The stream which fills Wesley lake does not carry any sewage after it reaches the Grove. Above that place there are two barns and a few people along its edges, where sewage to a considerable extent enters it. Plans are being prepared to remedy this by laying a large iron pipe or constructing a closed wooden way for the passage of the water beyond the limits of

the population. By the frequent letting in of the sea into the lake, it is believed that no evil results have followed from the outside sewage so far.

The sewer system has been extended during the past year at a cost of between three and four thousand dollars, and ninety-one connections have been made. The cost of taking away the garbage, over what was allowed by the farmers, has been twelve hundred dollars, and vault-cleaning, fifteen hundred. A plan is now under consideration, for the coming year, to carry the sewer pipes to a common centre on the ocean front, at a point equally removed from the bathing-houses, and carry the pipes out into the sea beyond the breakers, without the intervention of shore vaults.

OCEAN. - - - *Report from* GEO. W. BROWN, M. D.

Refuse which accumulates in the streets in the township, generally does not amount to much, merely a few leaves, &c., but in the villages, we are sorry to say, it is too much neglected. Our streets, in the village of Long Branch, are watered during the summer months, and, in the fall, we find them literally "water-soaked." Then, after one or two storms, together with the falling leaves and other refuse, which are not properly carried away, we have, through the main street especially, about four to six inches of nasty, bad-smelling mud, which is very apt, with occasional rains, to last for weeks at a time. We have had some malarial fever here, and this, I think, is partially the cause of it. I do not think the streets are properly cleaned by the proper officers more than once or twice a year.

The township Board of Health is the only one in the township, and this is governed entirely by the State laws. The Board is still in its infancy, this being the first year of our organization, but we feel that the township has already derived great benefit by having such a Board, as the complaints against nuisances have been quite numerous, and all have been promptly attended to and abated, some of which have existed for years previous.

The report also notices other defects, but as active measures have been taken, we believe they will soon belong to the past.

RARITAN. - - - - *Report from* S. V. ARROWSMITH.

Small-pox occurred in the centre of the town of Keyport. Proper quarantine of the whole block was instituted. The Physician of the

Board was directed to visit all the schools within the town limits, both public and private, and to make an examination of all children in attendance as to the necessity of vaccination, and, by a resolution, excluded all who did not bear satisfactory evidence of protection, until vaccination should be attended to. As a further precautionary measure, five hundred copies of the small-pox circular No. 2, as published in the State yearly report, containing precautionary instructions, were procured, and freely circulated throughout the town, a copy being placed in the hands of each family.

The disease, in both cases, assumed the most virulent hemorrhagic form, and on April 1st, the case which first developed—that of Mrs. C.—ended fatally. The other, that of Miss C., though of the malignant type of so-called black small-pox, succumbed to the treatment and recovered.

The vigorous action of the local Board, though condemned by a few, was generally approved by the public, and resulted in confining the disease to the house in which it first originated.

UPPER FREEHOLD. *Report from* JOS. HOLMES, M. D., *Cream Ridge.*

Malarial fever is reported as the most prominent disease of the past year.

SHREWSBURY. - - *Report from* RICHARD A. SICKLES.

The report shows that there has been much discussion over alleged sickness at Red Bank. There were some cases of fever, either of a severe remittent or typhoid type, but the locality is one naturally healthy. The objections in Red Bank and some other parts of the township, are the too near proximity of wells, privy-vaults and cesspools. If the Board of Health is well sustained by the co-operation of citizens, the good reputation of the locality can be easily maintained.

MORRIS COUNTY.

CHESTER. - - - *Report from* W. A. GREEN, *Chester.*

The springs are exceptionally good: I can now recall but a single exception. This spring is so situated as to receive the surface drainage, and furnish the water used by eight or ten families, in all of which a relaxed condition of the bowels has been apparent; whether

this pathological condition depends upon the continued use of this water as its exciting cause, or other filthiness, not prepared to say. The cisterns throughout the township are in a bad condition, the leaders have no turn-offs to convey away the first rain-falls, and consequently whatever organic or other impurities are deposited on the roofs are washed into the cisterns; this evil is almost universal. A great many cisterns are constructed altogether under buildings, and are entirely excluded from the air; some are never cleaned, others very seldom, while a few are carefully cleansed twice yearly. In most, if not in all cases, the pipes through which the water is drawn are lead. I do not know of a single instance where cast-iron pipe is used. A very few cisterns have filters, or rather, I should say, apologies for filters; for they are nothing more than a tin, zinc, or galvanized-iron receptacle filled with charcoal and gravel, through which the water passes as fast as received, and this gravel and charcoal are never replenished.

To report all the defects in drainage, natural and artificial, would perhaps require something to be said of nearly every house in the township; so, therefore, a single case to the point must suffice as a general exponent of what really exists to a greater or less extent throughout the township. Last summer, a year ago, I was summoned to attend a family composed of seven members, all of whom were stricken down by a low form of typho-malarial fever—the typhoid element markedly predominant. I at once began an examination of the premises to ascertain, if possible, the cause of this sudden and terrible outbreak. I found a well six feet from the back door, between which and the house milk-pans and kitchen utensils had been washed, and the waste-water, beside other slops and wash-water, had been thrown. From the well came a stench too horrible to describe. At this time, the water was so low the bucket would not fill. The water, however, had been used by the family until about two weeks prior to this time, when it became so offensive to smell and foul to taste, that they had to abandon it. Just around the corner of the house, say ten or twelve feet from the well, stood an overflowing swill-barrel, from which there was easy communication. All the family recovered except one, a young lady eighteen years old, in whom a hemorrhagic complication was superadded.

OCEAN COUNTY.

EAGLESWOOD. - - - *Report from* WM. P. HAYWOOD.

Water-supply is nearly altogether from wells; a few families, and I notice the healthiest ones and the longest lived, have always used spring or brook-water. In the principal village of this township, viz., West Creek, the well-water is exceptionally bad, hard, and of offensive smell. As the graveyard now well filled with the dead, is near the centre of the village, and on a rise of ground, and all the wells with offensive odor and bad taste are east of the graveyard, and near by (my own is about twenty-five paces), I have long ceased to use my well-water for drinking purposes, believing it to be contaminated with the decomposition of the dead bodies. If time would correct the evil I should apply to the Legislature to have the graveyard closed hereafter to interments, but from what I have seen and know, fifty years hence would make no improvement; the mischief is irreparably done in the former ignorance of our fathers. I have noticed that all the families living east of the graveyard have more or less sickness, a great deal more so than those living west of it; as the streams all run east to the bay shore, this may account for it. I had one death in my own family, and several others sick with typhoid fever. This happened several years ago; since then, we have stopped using well-water, and have been free from any diseases traceable to bad water. I find that where brook-water is substituted for well-water, children suffering from cholera infantum, or any one with bowel affections, rapidly recover, *i. e.*, where other proper means are resorted to, but medicine is of no use when well-water is used.

Our natural drainage is good. Some meadow and swamp lands have been artificially drained. No sewage matter of any account is carried off by brooks or streams.

The common mode of emptying privy-vaults is by mixing coal ashes, or road-dust, or its equivalent, with the contents, and removing a short distance, and covering with earth or sod, or both, and left sometimes for three to six months before using on corn or crops whose eatable product is above the ground. Some few ignorant persons use at once, even on their root crops.

PASSAIC COUNTY.

PASSAIC. - - - - *Report from* F. H. RICE, M. D.

Much need of sewers; no natural or artificial defects in drainage. Much less malarial fever this year compared with last. No State law as to drainage or any other laws been applied here. Cesspools generally used, and many of them in a bad condition. Slop-water from the kitchen discharged in cesspools usually, but sometimes in privies.

WAYNE. - - - - - *Report from* R. M. TORBET.

There are no defects in the natural drainage, except that noted last year. The amount of malarial fever has been less than last year, until the late severe storm, when there seemed to be a new outbreak of it.

There were quite a number of cases of scarlet fever in the township last fall. The disease was of a mild type, none of the cases being fatal. Also, a good many cases of mumps among the children of the different schools, making a slim attendance for a time.

There have been no especial cases of sickness since July 1st, except some small-pox cases in one family.

I think it would be well for the State Board to have prepared a set of ordinances in blank, to be sent to the local Boards, as a guide to them in carrying out the provisions of the act of last winter.

PATERSON. - - - *Report from* J. J. QUINN, M. D.

The report on vital statistics, and also that of the next year, will show the results of the small-pox epidemic, so far as deaths record it. It has had many incidents, caused much privation and great expense, but it demonstrated the need of a Board of Health under the State laws. The Board is formed too recently for a report.

MANCHESTER. - *Report from* WM. D. BERDAN, *Paterson.*

A few driven wells are used; some are satisfactory, and some are not.

The filters used are made of tin, divided into apartments, and these apartments separated by perforated partitions, the holes being smaller after each passage of the water; with an opening in front, so that leaves or litter of any kind may be removed at pleasure.

There is defective drainage in a piece of property near the village of Haledon. The physicians state it is the cause of malarial and other fevers in that neighborhood.

Otherwise, in this section, the amount of malaria is not so great.

The piece of property having defective drainage is soon to be properly drained and filled up with sand.

SALEM COUNTY.

MANNINGTON. - - - - *Report from* D. F. GRIER.

The report alludes to a disease of animals, also transmissible to man, which came under the cognizance of this Board, and was pronounced to be anthrax or splenic fever, in the earliest cases. Prof. Satterthwaite, of New York City, and his assistants also pronounced the disease anthrax, although, amid the swarm of bacteria, they did not discover the bacillus anthracis. Here, examination was confined to the blood taken from the vessels of the neck. This report confirms the diagnosis, as it is stated that Prof. Leidy, of Philadelphia, found in the liver or spleen the bacillus which is characteristic of the disease.

SALEM CITY. - - *Report from* HON. CHAS. S. LAWSON.

The Mayor reports the organization of a Board of Health. The arrangements of water-supply are completed.

UPPER PITTSGROVE. - - *Report from* C. H. NEWKIRK.

There has been an increase of malarial fever.

SOMERSET COUNTY.

BEDMINSTER. - - - *Report from* WM. P. SUTPHEN.

Instances have come to hand where it was necessary for our Board to recommend certain work to be performed, by which it is believed causes of sickness were removed. In every instance these instructions have been complied with. There is malaria in our township, not confined to any particular locality, and in instances cannot be charged to any known cause. Our observations are, that by writing on the door-posts of every house in the township "*Be Clean*," there would be less malaria and all other sickness.

BRIDGEWATER. - *Report from* A. P. HUNT, M. D., *Somerville.*

Citizens of our township depend upon wells, either dug or driven, principally the former, for water supply, save in Somerville and Raritan, in which a few are supplied by the Somerville and Raritan water works, from the Raritan river. We believe there are no objections to it, by those who use it.

The *Ancient* arrangement of water-closet construction still prevails, viz.: A pit is dug, probably walled, and the closet set thereon, and in very many instances, a well from which the family or families obtain their water-supply is in close proximity.

Serious and grievous complaints are made by farmers owning lands along the shores of the Raritan river, by reason of the refuse matter turned from the dye-house of the woollen mills at Raritan, into the river, thus impregnating its waters with the chemicals and refuse material therein contained. A few isolated cases of enteric fever are believed to have been traced to local causes.

HILLSBOROUGH. *Report from* W. H. MERRILL, M. D., *South Branch.*

It is believed that, if a cistern is large enough and especially deep enough, and well kept, that it affords very good water. Of course, it is desirable that the roof from which it is collected should be slate. Quite a number of driven wells are in use. Further time must elapse before we can tell how satisfactory they are.

As to malarial fever, there have been fewer cases, but the tendency to head symptoms has been marked, and severe congestion of the brain has been associated often enough to be noticeable.

During the spring, pink-eye was prevalent, but few deaths resulted. Chicken cholera has been less prevalent than in recent years. Those who have been troubled with it, do not try to raise many fowls, or sell the chickens early in the season.

No nuisance from trades of factories. However, it may here be noted that the attention of the Board has been called to a nuisance at Van Aken's station, caused by drainage from a silo used for storing beer-grains for cattle.

SUSSEX COUNTY.

BYRAM. - - - *Report from* C. F. COCHRAN, M. D.

The Health Board investigated the cause of three cases of typhoid fever at a farm-house, and traced the poison to a covered drain leading from the house; the remedy was applied, and no further trouble has been reported. A complaint was made by Mr. John Rose, that stagnant water was allowed to stand near his house, the water coming from the streets of Stanhope as well as from the houses on said streets. An investigation was made and a remedy sought.

GREEN. - - - *Report from* S. VAN SYCKLE, *Andover.*

In this township, there are three mills run by water, namely, Hunt's mills, Tranquility, and Huntsville. Tranquility and Huntsville have, in the past years, been very unhealthy on account of the lowness of the water, which uncovers the mud and leaves it bare to the air. But for this year, they have been much more healthy.

STILLWATER. - - - - *Report from* C. V. MOORE.

The report shows that there are in the township too many cases of periodic fevers, and that the drainage of parts needs to be carefully considered.

UNION COUNTY.

PLAINFIELD. - - *Report from* H. H. LOURIE, M. D.

The epidemic of measles, last spring, in Plainfield, was unusually severe, and several deaths occured. An oilcloth factory has been complained of because of its odors. Driven wells are sometimes found impure and deepened. The city has no sewers.

SUMMIT. - - - - - *Report from* D. M. SMYTHE.

The Board have given especial attention to privy-vaults and cesspools, and have pleasure in reporting that the ordinances of the Board in relation thereto, are being complied with, and the danger heretofore existing from overflow drains is rapidly diminishing. Cesspools and privy-vaults are emptied by means of the "odorless excavating pro-

cess," and the refuse and excreta, after being made innocuous, are composted for fertilizing purposes.

A charitable institution—half orphan asylum—under the auspices of the Episcopalian denomination, has been opened since last report. The health of its inmates is provided for by careful sanitary arrangements.

The Board, chiefly through persuasive influence, have been instrumental in abating several nuisances, and placing many locations upon proper sanitary bases; every pond in the thickly-settled portion of the township has been *drained and filled*. The Board have in contemplation other important sanitary improvements.

No prevalent diseases during the last year.

The people at their last annual town meeting, voted an appropriation of *five hundred dollars* for health purposes, by means of which the Board have been enabled to correct certain conditions which would have ultimately become destructive to health interests.

The poulation of the township is two thousand and sixty-nine.

WARREN COUNTY.

BELVIDERE. - - - - *Report from* ISRAEL HARRIS.

There were several deaths from scarlet fever, and measles largely prevailed. Public funerals in case of deaths from scarlet fever were not had.

PHILLIPSBURG. - - - *Report from* S. W. DEWITT.

A special nuisance is a stagnant drain with not sufficient fall to carry off the bad water which collects therein. The council have promised to abate the same, but have not yet made a beginning.

No special disease of animals, except, early in the summer, the horses belonging to the street railway company were prostrated with a throat and head disease, and were not used for some weeks. They called it distemper.

No particular improvements, except that the Board has strictly enforced its ordinances in all respects, and the result is a better sanitary condition.

We know of no cause of disease prevalent. We have been surrounded with small-pox in neighboring towns and villages, but have had no cases here.

The malaria, which a year ago was prevalent during the dry season, has not made its appearance this season. We have heard of but few cases of the chills, while a year ago the town was full of it. We reorganized our Board of Health under the act of 1882, and adopted a code to govern us, but thus far have had no occasion to enforce at law any of its sections.

I think the Boards of Health of towns as well as of cities, should control the sale of milk, instead of having to call upon the State inspector; as it is under the present law, local Boards have no power to stop the sale of bad milk, but must call upon him.

OXFORD, - - *Report from* L. B. HOAGLAND, M. D.

During the fall and early winter of 1881, scarlet fever was quite prevalent in our township, and as our Board of Health was not then organized, nothing was done to prevent its spread, except what was done by the physicians, individually. There were, in all, about sixty cases and ten deaths; the majority of the deaths being from convulsions, during the first and second days of the disease. Would also note that there was an unusually large number of cases of dropsy followed it. Also a wide-spread epidemic of measles; no deaths.

About the middle of March, 1882, there occurred in the town of Oxford a case of discrete small-pox, supposed to have been contracted by a man loaning a stranger a shirt to sleep in one night, and then wearing the same himself, without its having been washed. With this as a centre, it spread until we had, in all, thirty-five cases. The Board of Health was organized at once, and adopted a stringent code of ordinances, relating to the spread of contagious diseases, which were posted throughout the township.

Meetings of the Board were held weekly, and all houses where small-pox was known to exist, were quarantined, and patrolmen hired to enforce the code of ordinances and supply the inmates of the infected houses with the necessaries of life.

Of the 35 cases, 16 were confluent, 7 discrete, 12 varioloid. There were seven deaths in all.

No person previously vaccinated was attacked with confluent small-pox, and no deaths occurred where persons had been vaccinated. About fifteen hundred persons were vaccinated during its prevalence, one-third of them with humanized virus, and the remainder with non-humanized bovine virus, the constitutional effect being much the

more marked when the latter was used. One child, of 5 years, lost its life by taking cold in her arm; gangrene set in, and she died from septicæmia. Some of the sores were three or four months in healing.

At present, October 25th, 1882, there is considerable malarial fever in our township, and almost all the cases show a disposition towards a low typhoid type. Have had a few cases of undoubted typhoid fever, due, I think, to personal filth and improper ventilation of houses, together with bad drainage of the soil. The attention of the Board will be called to the existing conditions, and some action taken at once.

WASHINGTON, - *Report from* WM. M. HARTPENCE, M. D.

Public health laws are attended to only, as yet, upon complaint of the existence of a nuisance, or infectious or contagious disease, &c. The Health Board has no regularly appointed time for meeting, with the exception of what the State requires. The sanitary matters of this township are placed in the care of an acting health physician, who is Secretary of the Board and is authorized by the Board to act promptly in abating and removing all nuisances, &c., &c. The township is not provided with a pest-house or hospital. The registration of vital statistics is kept as the State law directs for all townships. For sanitary expenses and for the indigent poor, we will have to appropriate not less than one thousand dollars, due to an outbreak of small-pox, a report of which is herewith appended. The heating of houses is mostly by stoves, coal and wood being the fuel used.

About the 1st of April, 1882, information reached us, through private sources, that small-pox had broken out at Oxford, a small town lying north of us, where mining and the manufacturing of nails are carried on quite extensively. The southern limits of this town lie within this township. On May 3d, we received notice from the local Board of Health of Oxford township that the disease had spread to one family within our limits. A meeting of the Health Board was immediately called and the whole matter placed in the care of the acting physician. The infected family was immediately visited, and it was found that a small child had confluent small-pox. The family, consisting of nine members, together with the premises, were forthwith placed in quarantine, notice of "small-pox" was posted upon the house, and the whole put in charge of an officer. On the evening preceding the notice given the Board of Health, one of the daughters of the family was married, and several guests from Washington and Oxford

were present on that festive (?) occasion, while, at the same time, the child was lying up stairs (the house consisted of two rooms only) with this most loathsome disease, unvaccinated. There were five others also unvaccinated in the family. These were immediately ordered to be vaccinated, but the parents positively refused, giving as an excuse their belief that the conjoint effects of vaccination and small-pox would certainly kill the children, and no amount of persuasion and argument would convince them to the contrary, and, as the law did not *compel* them to be, the result was that three out of the five soon sickened and died with the most violent form of the disease. The parents, who had been vaccinated years ago in Ireland, had varioloid, but in a light form. The developments of the wedding were looked to with a deal of interest, you may judge, but, thanks to the immortal Jenner, vaccination, that efficient prophylactic, saved the whole county hereabouts. Out of the whole number of guests there were only three or four contracted the disease. One young woman near by, and within this township, took varioloid and gave it to her mother, rather an elderly woman, but vaccination saved them.

Another family, also living near by, consisting of six members, parents and four children at home, neither child vaccinated, took the disease. The first case, one of the children, resulted in death. Seeing the bad results from family number one, they consented to immediate vaccination when the first child was declared to have the disease. Fortunately, the vaccinations were all successful, and the result was that neither of the three remaining were ill enough to be kept in bed one day. If these are not cases in point positive of the efficacy of vaccination in mitigating or entirely aborting small-pox, then our judgments are certainly very deficient. As a result of the presence of this epidemic, a general stampede for vaccination was made popular, and vaccinations were resorted to by old and young, and it would be difficult to find one to-day unvaccinated or upon whom several attempts were not made.

Bovine virus was generally used, and our observations lead us to conclude that the constitutional effects were greater in a larger number of cases than we had observed in years past when using humanized virus; and, also, our experience makes us believe that the resulting sores were longer in healing (speaking in general) than with the humanized virus.

Scarlet fever appeared in the township during the spring months, but did not assume a marked epidemic character and was of a medium

type. There seemed to be an unusual tendency, especially in the milder cases, to albuminous nephritis afterward. Malarial or periodical troubles, as usual, prevail, but not to the same extent as heretofore.

Most of the other reports contain matters of local interest and information, which, together with the returns of vital statistics, enable us to judge of the health of the respective localities. It is especially apparent how many of the Boards of townships are increasing in efficiency and in their comprehension of the fact that undrained land and small villages, and often individual households, have local causes of disease. Much more watchfulness is used than formerly, and the people are becoming more intelligent as to needs, if not always as to methods. Now, it often occurs that in the local Board are one or more persons who carefully read the reports or other sources of knowledge, and thus become of great advantage by their advice in preventing, as well as managing, nuisances or other conditions unfavorable to public health.

REPORT UPON HEALTH FOODS, INVALID FOODS AND INFANT FOODS.

BY PROF. ALBERT R. LEEDS, PH. D., MEMBER OF COUNCIL OF ANALYSTS OF NEW JERSEY.

The importance of extended inquiry into the various subjects comprised within the scope of the present article may be best gathered from the following considerations:

1st. The preparation of these various kinds of foods has become a great and growing department of manufacturing industry. The amount of capital invested is very large, the competition keen, the temptation to put upon the market inferior and adulterated articles pressing, and the opportunities for deceitful advertising almost unlimited. 2d. The relative value, as food-substances, of these various preparations cannot be determined by a merely superficial examination, nor, in most cases, is the microscope alone sufficient, and this has led to the recent attempt, on the part of some manufacturers, to destroy the reputation of many articles of prepared foods, and to ruin the business prospects of their competitors in trade, by false and malicious publications. 3d. The necessity of health and invalid foods for thousands who are suffering from functional disturbances of the digestive organs, from diabetes, etc., is fully recognized by the medical profession, and the corresponding importance of encouraging the manufacture and sale of excellent, and of preventing that of inferior and adulterated articles. 4th. The frightful mortality among infants is due more largely to diseases of the organs of digestion than to any other single cause, and for this reason it may properly be said that no subject can claim for itself a more anxious and careful study than that of infants' foods. And when we discover, as we shall later on, that in some instances manufacturers are selling largely for infants' food

preparations entirely destitute of those elements upon which the nutrition of the body depends, and which could not be persistently used without permanent injury or resulting death, the criminality of such traffic can be adequately appreciated.

METHODS OF INVESTIGATION.

Before giving in detail the analytical methods employed, I regard it necessary to discuss the relative value of the results which can be obtained by the use of the microscope alone, and those which can be obtained when, in addition to the microscope, all other aids to complete investigation of foods are made use of. This preliminary discussion is necessary because of the claim recently put forth by Dr. E. Cutter that the microscope alone is sufficient for the purpose, and as a result, he has been led to make many false statements, at present circulated broadcast throughout the community and calculated to inflict much injury upon manufacturers and consumers alike.

In the examination of the various kinds of food-substances, I relied upon three sources of information: 1st. Their appearance under the microscope. 2d. Their physical properties and their behavior when washed with water, etc. 3d. Chemical analysis. At the outset I hoped, that by means of the microscope alone, sufficient information could be obtained to enable me to form an approximately correct estimation of the relative amounts of starch, gluten, cellulose, etc., in the flour, and so to form an opinion as to its food value. I had been constantly employed in the use of the microscope for detecting the adulteration of food, and had found that it often gave sufficient information to make it possible to dispense with chemical examination. This was frequently true of the spices, in the adulteration of which the starches of various cereals, powdered crackers, etc., are largely employed. I anticipated a similarly satisfactory result in the examination of the cereal foods themselves, but in practice this anticipation was not sustained. The reason is, that to admit of identification under the microscope, the physical characters of the bodies observed must not be destroyed by any treatment to which they have been subjected. Now, in the preparation of cereal foods, by the processes of milling, and in some cases of washing, to which they are subjected, the appearance of certain constituents of the grain is so far altered as to make their certain recognition very difficult and their quantitative estimation impossible.

What I mean by this statement will be more clearly seen by com-

paring the actual results of a chemical analysis of flour with those obtained by the microscopic examination. By analysis we can readily and accurately determine the percentages of starch, gluten, cellulose, albumen, gum, sugar and fat. Of course, it is out of the question to determine more than the first three constituents, viz., the starch, gluten and cellulose, by microscopic examination. But can we do so much as this? Can we even form a tolerably accurate guess at their relative percentages? I have made a great many attempts to do so, and have entirely failed. And lest any microscopist charge this failure to a lack of faithful use of the microscope, let me suggest that he subject his results to the only rigid proof of their accuracy. Let him first make a quantitative estimation of the percentages of starch, gluten and cellulose by means of the microscope, and then determine the precise percentages by chemical analysis. And, in order that he may be entirely without bias in his judgments, let him conduct the inquiry in the order named: first with the microscope and then with the balance, because the eye has a marvelous proneness to see whatever the mind is previously persuaded actually exists, but the chemical balance errs not. And if this course is taken, and the results of the microscopic examinations are carefully noted down, as I have myself done in the case of more than thirty differently prepared wheat flours, and afterwards compared with the figures obtained by chemical analyses, no manner of agreement will be found between them. For example, I find in my notes that a sample of a certain wheat flour finely ground, exhibited under the microscope a "large amount of starch, some gluten, and a considerable amount of fibrous tissue." I did not attempt to translate these results into figures, from a feeling of utter inability so to do, but thought that the adjectives might be useful for future reference. Another sample of flour, claiming to contain the constituents of wheat flour in the the same proportion as the original wheat grain, is put down as remarkable for the large number of perfect unruptured gluten-cells which it contained, and which gave rise to the impression that the relative amount of starch in this sample was small. Subsequently, both these flours were analyzed, and the former was found to contain 60.95 per cent. of starch, and the latter 70.98 per cent. In other words, the flour which I judged, from its microscopic examination, to contain the lesser amount of starch, actually contained 10 per cent. more than the other. To take another illustration, I find among my notes allusions to two samples of flour, specially prepared to diminish the natural percentage of starch, and which apparently

had the same relative amounts of starch when viewed under the microscope. But the one contained 59.72 per cent. of starch, the other 64.67 per cent.

It may properly be objected to these results, that I am speaking of cases where there was only a difference of five to ten per cent., and that in the cereal foods which are under discussion, the differences are much greater, so great, indeed, as to make an approximate quantitative analysis by the microscope possible. But I do not think this objection will hold good. For, in the first place, the amount of percentage variation in the composition of flours prepared with especial reference to their containing the constituents of the entire wheat, and those prepared like ordinary flour, and those prepared with a view of artificially raising the percentage of albuminoids to a maximum, is not by any means so great as is generally supposed.

I spoke above of a flour claiming to represent the wheat grain in its entirety, and with none of its constituents changed from their natural proportions. It contained 70.98 per cent. of starch. Another specimen, likewise supposed to contain the unaltered constituents of the entire grain, contained but 62.46 per cent. of starch. There is no reason to suppose that these flours did not represent the entire grain, because I have analyses of the entire grain, containing these same percentages of starch. Still another contained 72.65 per cent. of starch, and the latter may be taken as a maximum, or, if not a maximum, not far below the maximum, and having the advantage of being a figure determined by myself upon a sample of American flour. So, too, the number of 62.46 may be taken as not far from the maximum in a flour representing the entire wheat. Here we have a variation of only ten per cent., and yet the properties as food-substances of those whole wheat flours would be quite different.

I find notes of my own analyses of ordinary wheat flour, with percentages of starch varying from 65.66 per cent. to 71.41 per cent. These figures, like all the preceding, refer to the undried substance; on the dried, they would be 75.11 and 81.82 per cent., respectively. I do not happen to have analyzed wheat flour presenting as great variations in composition as the specimens analyzed by Vauquelin (Ure's Dictionary, p. 48,) according to which analyses the flour made from the hard wheat of Odessa, contained (undried) 56.50 per cent. of starch and 14.55 per cent. of gluten, and the flour made from the soft wheat of Odessa, 72.00 per cent. of starch and 7.30 per cent. of gluten. These are astonishing variations, the difference between the minimum and maximum of starch being nearly 16 per cent.

Finally, with regard to the cereal foods artificially prepared, I have samples in which the percentage of starch is as low as 49.43 per cent. (undried.) The entire range of variations is, therefore, between 49.43 per cent. and 72.65 per cent.; the balance in each case being gluten, and other bodies not starch. The problem, in other words, is not to decide between cereal foods containing no gluten and those which do, but between cereal foods rich in gluten, and those poor in gluten. There are no cereal foods, or even the poorest ordinary wheat flours, which do not contain some gluten. On the other hand, there are no artificially prepared cereal food-substances which do not contain starch. I thought that possibly a non-starchy food-substance might be found in the "Farine de Gluten," and purchased a package containing five hundred grams, at the price of a dollar. The high price surprised me, and I thought it was probably due to the labor involved in eliminating the starch.

This gluten is almost tasteless, very finely ground, and under the microscope shows abundant starch-grains. I did not see any unbroken gluten-cells—although I am not prepared to say they do not exist, and may have escaped unruptured from the processes to which this French gluten is subjected. Chemical analysis gave for the starch 53.38 per cent. (reckoned on the undried, 60.04 per cent. computed to the dried sample.) This result made me well nigh certain that the percentage of gluten in this so-called "Farine de Gluten" must fall considerably below one-half, and subsequent experiments show that I was not mistaken.

On looking over my own results, obtained by the use of the microscope and chemical analysis, and comparing them with recent publications on this subject, I find that I am in substantial agreement with Dr. George B. Fowler, judging from the results of his observations, detailed in his article upon "Farinaceous Infant Food" (Am. Jour. of Obstetrics, XV., p. 449,) and in agreement, also, with Prof. Jos. G. Richardson, M. D., as his views are given in an article entitled "A Serious Microscopic Blunder" (Philadelphia *Med. News*, June 1882.) On the other hand, my own results are entirely at variance with the statements contained in a paper on "Cereal Foods under the Microscope," published in the *Amer. Med. Weekly*, Jan., 1882, by E. Cutter, M. D.

In the last article, it is stated that wheat and other grains consist almost exclusively (which is untrue) of gluten and starch, and that the estimation of the relative amounts of these two ingredients can be

effected with certainty by the use of the microscope alone. The falsity of this assumption is most strikingly shown by the erroneous conclusions to which it has conducted its author. It has led him to make statements altogether at variance with those of the recognized authorities on the subject of cereal foods, and in contradiction to those supported by chemical analyses of the foods under question.

I do not wish better evidence of the unscientific nature of Dr. Cutter's methods of microscopic examination than his own statements. He acknowledges himself that in the mechanical processes to which the grains of wheat are subjected, the gluten-cells are ruptured, but proceeds throughout the article on the assumption that the richness of a flour in gluten can with certainty be detected under the microscope by the relative number of gluten-cells. This assumption leads him in the outset to state that "in making flour, three-fourths of the gluten is removed, and the chief strength of the flour is thus destroyed." If the gluten is removed, then chemical analysis ought to fail to find it. But chemical analysis tells an entirely different story. I find, according to Vauquelin, that the minimum amount of gluten in the wheat flour analyzed by him, was 7.30 per cent., and the maximum amount 14.55 per cent. The amounts of starch in these two extremes were 72 and 56.50 per cents., respectively, the starch varying approximately inversely with the gluten. I say approximately, because other constituents vary also, and the correspondence is only approximately correct. Thus, according to Vauquelin, one sample of flour from the soft wheat of Odessa contained 12 per cent. gluten and 62 per cent. of starch. Another sample from the same Odessa wheat contained 12.10 per cent. gluten and 70.84 per cent. starch, or more than 7 per cent. greater of starch. But the former has as much as 7.56 per cent. sugar, the latter only 4.90 per cent. The average percentage of gluten in the eight samples of flour analyzed by Vauquelin (loc. cit.) was 10.93 per cent., of starch 68.08 per cent. (computed on the undried samples.) According to Prof. R. C. Kedzie (Rep. Mich. Bd. Agr. 1877, p. 350,) the average of sixteen analyses of Michigan winter wheat flour gave 10.54 per cent. albuminoids (principally gluten), with a maximum of 12.25 and a minimum of 8.94 per cent. According to the same authority, the average of five samples of Kansas spring wheat flour showed 12.58 per cent. albuminoids, with a maximum of 13.56 and a minimum of 11.37 per cent. Let us now see how these figures compare with the amounts of gluten and starch in the grain before grinding. I shall use the term albuminoids rather than gluten in making

these comparisons, because "albuminoids" include all the nitrogenous portion of the grain, while "gluten" should properly be restricted to that portion of the albuminoids which is insoluble in water. Inasmuch, however, as gluten forms by far the largest part of the albuminoids, it is frequently used as including, in opposition to "starch," the nitrogenous part of the grain.

Now, the average amount of albuminoids in forty-nine samples of American winter wheat (Rep. Conn. Agr. Ex. Station, 1880,) was 11.71 per cent., with a maximum of 14.47 and a minimum of 8.40 per cent. The average of six analyses of the spring wheat was 12.67 per cent. of albuminoids, with a maximum of 15.4 and a minimum of 8.14 per cent. According to König (*Die Menschlichen Nahrungs und Genussmittel*, II. 273,) the average composition of two hundred and fifty samples of European wheats was 12.42 per cent. albuminoids and 64.07 per cent. starch. Is there any support given by these figures to the statement that three-fourths of the gluten is removed from wheat in its conversion from grain into flour? The popular notion that there is an almost entire removal of gluten in the process of milling, is a wide-spread fallacy. The assertion by Dr. Cutter that three-fourth of the gluten had been removed in making the flour examined, really means that his microscopic examination was utterly inadequate to find it. Almost all the gluten originally present in the grain was in the flour, but by the microscope he could find only twenty-five per cent. of it.

Whilst I relied principally upon chemical analyses in conducting these inquiries, and assigned to microscopic and physical examination a secondary place, yet the results thus attained are in close accord with those arrived at by Dr. Fowler, who relied chiefly upon the microscope, and those of Dr. Richardson, who depended upon physical separations merely. The conclusions arrived at by the former are thus summed up: "*Simple microscopic inspection, unaided by chemical means and physical processes, is wholly unreliable and inadequate in determining the composition and nutritive worth of farinaceous substances.* * * * I am prompted to thus repeat and insist upon these points, because I see that so reliable an authority as Dr. Jacobi* has accepted and enthusiastically endorsed the conclusions aimed at by Dr. Ephraim Cutter, * * * who relies altogether upon the absence or presence of gluten-cells in estimating the nutritive value of farinaceous preparations. I must, with all respect, protest against Dr.

* Infant Feeding and Infant Foods, *Med. News*, Feb., 1882.

Cutter's method, his conclusions and his physiological arguments, as well as the remarks of his editor, Dr. Gailleard."

Equally strong language is used by Dr. Richardson. He says: "Dr. Cutter asserts that the opaque, oval or rounded cells (constituting the fourth coat of the wheat grain, according to Prof. Parkes,) afford most of the gluten, and hence on their presence the chief strength of the food depends." He therefore declares that a large number (fourteen) of the food-stuffs he examined, and found under his microscope to display none of these so-called "gluten-cells," "contain no gluten," (page 9), and broadly intimates that they are consequently frauds upon the public. But the fact is, these so-called "gluten-cells" (denominated by Payen, *oleiferes*,) probably include in their substance starch, phosphates, fatty matters and coloring materials, containing only part, perhaps, but a small part, less than one-seventh, of the gluten which exists in wheat. Thus, Peligot, as a mean of fourteen analyses, gives the percentage of gluten in flour (whence "gluten-cells" are removed) at 12.8, while in bran (containing nearly all the "gluten-cells") it is only 10.84, and other observers confirm his statements. If my friend, Dr. Cutter, or any of his disciples, would like to satisfy himself that he has made a lamentable mistake in this matter, let him take say ten grams of one of the fine flours he asserts "contain no gluten," mix it with water into a dough, let it stand for half an hour and then stir it in a porcelain capsule, with successive portions of water, until the starch is washed away, and the adhesive fibrillated gluten is left nearly pure, in the proportion, after drying, of from seven to twelve per cent. (*Vide* Parkes' Practical Hygiene, fifth edition, 1878, p. 224.) The small starch-corpuscles and granules, left by this process entangled among the threads of gluten, can be beautifully differentiated by adding a drop of iodine solution, which affords the usual deep-blue reaction with the starch, but dyes the gluten filaments of a yellowish-brown tint.

Inasmuch as I have not been able to analyze all the great variety of health, invalid and infant foods in the market, I shall discuss only those to which my attention has been directed, and shall classify these, for the sake of convenience, in the following manner. The amounts of ash and saline constituents were not determined:

A. *Wheat.* Not previously cooked or baked, including: 1. Diabetic Light, and 2. Dark Gluten. 3. Gluten Flour. 4. Fibrine de Gluten Conor. 5. Fine Granulated Wheat. 6. Franklin Flour. 7. Arlington Wheat Meal. 8. Arlington Mills Graham.

B. *Wheat.* Previously prepared by cooking or baking. 9. Hazard's Graham Farina. 10. Blair's Prepared Wheat Food. 11. Hubbell's Prepared Wheat Food.

C. *Barley.* 12. Imperial Granum. 13. Ridge's Food.

D. *Oat Meal.* 14. Baby Sup, No. 1. 15. Baby Sup, No. 2.

E. *Mixtures of Various Cereals.* 16. "A. B. C." Cereal Cream. 17. "A. B. C." Cereal Milk. 18. Robinson's Patent Barley. 19. Farwell & Rhine's Gluten Flour. 20. Savory & Moore's Best Food for Infants.

F. *Milk Foods.* 21. Nestlé's. 22. (*a*) Anglo-Swiss. 22. (*b*) American-Swiss. 23. Gerber's.

G. *Liebig Infant Foods.* 24. Mellin's. 25. Hawley's. 26. Horlick's.

Non-farinaceous. 27. Keasbey's and Mattison's.

A. *Wheat, not previously cooked or baked.* My attention was more particularly drawn to this class of health foods by the request of my colleague, Prof. Robt. H. Thurston, who had been using the preparations of the N. Y. Health Food Co. for years in his family, and who was startled in common with many others who had been habitually using them, by the statements above alluded to of Dr. Cutter that these foods contained no gluten. Nos. 1, 2, 3, 5 are preparations of the New York Health Food Co. No. 4 is the French gluten so much prescribed by physicians to diabetic patients. Nos. 6, 7 and 8 are flours and meals recommended by Dr. Cutter, on the strength of his microscopic examinations, as of superlative richness in gluten. No. 6, the Franklin flour, being pronounced by him the best flour examined, and a reliable infants' food.

	Moisture	Sugar	Starch	Albuminoids.
1 Diabetic light gluten	11 90	3 67	49 53	23 18
2 Diabetic dark gluten	11 89	4.09	49 63	23 18
3. Gluten flour	9 23	2 12	63 17	28 24
4 Fibrin de gluten Conor	11 10	5 32	53 98	21 92
5 Fine granulated wheat	10.75	4 77	60 95	13 62
6. Franklin mills flour	11 00	3 72	65 23	8 55
7 Arlington wheat meal	11 90	...	.....	7 79
8 Arlington mills graham	13 23	...	.....	7 09

It is important to invalids to note that the American gluten has less sugar and starch and more albuminoids than the very expensive French preparations. The Franklin flour contained not only little gluten, but so much bran that, when used for infants' food, it was soon abandoned on account of resultant diarrhœa.

B. *Wheat, previously prepared by cooking or baking.*

	Hazard's Graham Farina.	Blair's Wheat Food.	Hubbell's Wheat Food.
Moisture	9.12	9.85	7.78
Fat	0.81	1.56	0.41
Grape sugar	2.19	1.75	7.56
Cane sugar	2.49	1.71	4.87
Starch	69.68	64.80	67.60
Soluble carbohydrates	6.35	13.69	14.29
Albuminoids	8.48	7.16	10.13
Gum, cellulose, etc	5.56	2.94	undet.

9. *Hazard's Graham Farina.* It is claimed that this preparation is made out of the choicest Genessee white wheat; that it is baked twice, so as to be ready for immediate use without further cooking, and that by the processes employed the starchy and fat-generating substances are removed, whilst all the phosphates, etc., and nutritive qualities are retained.

This farina has a dry, rather flat taste, like ground crackers. When cooked according to the directions, it has a brownish-yellow color, with the smell and taste of crackers. It is palatable, but not so much so as either of the other two preparations included in this subclass. The percentage of gum, cellulose, etc., is very large. The amount of starch is greater than in either of the other two, whilst the soluble carbohydrates are much less. These differences account for the less palatability of this preparation.

10. *Blair's Wheat Food.* It is claimed that this is prepared from choice wheat in such a manner as to retain all the nutritive constituents and reject those which are irritating or otherwise objectionable. Moreover, that by thorough cooking, such physical and chemical changes have been brought about as to facilitate mastication and the subsequent action of the fluids of the stomach, thereby rendering the food more easily digested. It is stated to be especially beneficial in intestinal-like dysentery, cholera infantum, etc.

Uncooked, this flour has a sweet, pleasant taste. When cooked according to directions, it forms a very smooth paste with a faint tinge of color, resembling arrowroot in its flavor and quite palatable without the addition of salt, sugar, milk or other accompaniment.

11. *Hubbell's Wheat Flour.* Claimed to be made from wheat alone, floured, and carefully baked from eight to ten hours, at about the temperature of boiling water. "It includes all the flesh-forming constituents, earthy and saline elements of the grain, with only a portion

of the starch and none of the silicated coating. It keeps without change."

This flour is quite sweet and palatable even in its uncooked form, and when moistened with the saliva is more pasty than the Blair's Wheat Flour. When cooked it forms a perfectly white, smooth paste with a very delicate flavor. It is more starch-like in consistency than Blair's, a difference due in part to the larger percentage of starch, and less pronounced in flavor, this being probably due in some degree to the smaller percentage of fat. In both Blair's and Hubbell's the percentage of gum, cellulose, etc., is extremely small, in the latter case so small that it was not determined. In nitrogen Hubbell's is much richer than either of the other two preparations, and its value for purposes of nutrition correspondingly greater. The reaction of the Graham Farina, of Blair's Food, and of Hubbell's, is in each case neutral.

The excess in the amount of saccharine matter in Hubbell's Food above that contained in ordinary wheat flour induced me to write for the particulars of the process used, and to institute an analysis of the original flour from which the food was prepared, in order to discover the nature and the extent of the change it had undergone. The process, I was informed, is as follows: A large baker's oven is heated to about 340° to 360° F. The flour, contained in shallow Russia-iron pans, is then put in, the fire having meantime been withdrawn, the oven closed, and the flour left there about twenty-four hours. When the oven is re-opened the temperature will have fallen to 100°, and after sieving, the prepared flour will be ready for use. The flour used is the best grade as made by the roller process, the second grade containing more starch, less gluten, being that bought and used by bakers.

The change in composition produced by this process will be seen by an examination of the same flour before and after baking.

	Wheat Flour.	Same Baked.
Moisture	9.02	7.78
Fat	1.01	0.41
Grape sugar	2.34	7.56
Cane or inverte sugar	2.46	1.87
Starch	76.67	67.60
Soluble carbohydrates	5.98	11.29
Albuminoids	6.40	10.13

It will be seen that the flour has lost moisture in baking and also a portion of its fat. These changes, however, are of little moment com-

pared with the considerable decrease of starch and its conversion into saccharine bodies. The soluble carbohydrates are considerably more than doubled, and this change is one of the greatest value and importance, so far as the dietetic value of the prepared food is concerned. The considerable increase in the percentage of albuminoids I am unable to account for.

C. *Barley.*

	Imperial Granum.	Ridge's Food.
Moisture	5.49	9.23
Fat	1.01	0.63
Grape sugar	trace.	2.40
Cane sugar	trace.	2.20
Starch	78.93	77.96
Soluble carbohydrates	3.56	5.19
Albuminoids	10.51	9.24
Cellulose, gum, etc	0.50	......

12. *Imperial Granum.* It is stated to be "in composition principally the gluten derived by chemical process from very superior growths of wheat—a solid extract." Dr. Fowler states as the result of his microscopical examination, that if the material from which this preparation is derived contains any gluten at all, the "chemical process" resorted to in order to extract it, has at the same time either destroyed it or so altered its character as to render it no longer recognizable by the usual tests. This is an excellent illustration of the difficulty which is encountered in deciding with the microscope upon the constitution of a cereal after treatment, for whilst Dr. Fowler's statement of the microscopic appearance is correct, yet as a matter of fact the Imperial Granum contains 10.51 per centum of albuminoids. On the other hand this is not sufficient by any means to bear out the statement that the Imperial Granum consists principally of gluten. According to Dr. Fowler it is simply coarse barley flour.

13. *Ridge's Food.* It is advertised as prepared from carefully selected winter wheat, reduced to an almost uniform fineness. The product is then thoroughly cooked by a steam-baking process, which gradually changes a large proportion of the starch into dextrine, excluding only the woody fibre. It is afterward rendered a little sweet and slightly alkaline.

Dr. Fowler states that the Ridge's Food is apparently barley flour finely ground, and that the odor, dough and microscopic appearance indicate no other ingredients. I have accordingly so placed it,

although both in this case and in that of the Imperial Granum my own observations would have included them among the wheat preparations. Both of these foods when cooked are very palatable. Both have a neutral reaction. Both have a considerable percentage of albuminoids, that of Imperial Granum, in the two samples analyzed, being the higher, and both have a very high percentage of starch.

It should be very carefully borne in mind that wheat flour after careful baking is extensively altered, and that the albuminous bodies become considerably more soluble in water. A wheat flour which in its original condition would yield a very considerable amount of crude gluten, on washing, after baking, will leave a much smaller amount of gluten, and for this reason the percentage of crude gluten in baked flours cannot be roughly estimated by washing and drying. For the same reason a baked wheat flour may be mistaken for barley flour, which gives a non-glutinous dough.

D. *Oatmeal.*

	Baby Sup, No 1	Baby Sup, No. 2.
Moisture	5.51	11.48
Fat	1.28	0.62
Grape sugar	2.20	2.44
Cane or invert sugar	11.70	2.48
Starch	61.99	51.95
Soluble carbohydrates	14.35	22.79
Albuminoids	9.75	....
Cellulose, gum, etc	7.09	....

No. 1 is advertised as an excellent substitute for mother's milk, in case of infants under four months of age. It is a very sweet, partly crushed whole oatmeal, very palatable even before cooking and dissolving readily in the juices of the mouth. It is prepared from malted oats, and after the conversion of the starch has gone as far as it is thought it will proceed, the oats are carefully hulled, only a residue of the coat being left in the crack of the grain. The analysis shows the lowered percentage of starch and the increase of saccharine bodies due to this treatment.

Baby Sup, No. 2, consists of wheat flour, malted barley and potassium bicarbonate in the proportions given in Liebig's formula. In its dry state the mixture has but little taste, but becomes thin, sweet and palatable on cooking. The analysis gives but a partial result of this change, because the food was cooked only five minutes before the analysis, whilst the directions call for a half hour's cooking. But

already much of the starch had been converted into dextrin. These foods are most commendable efforts to carry Liebig's views into practice, and it is to be regretted that a certain amount of care and time is requisite to properly cook them, and for this reason they will probably have only a restricted use.

E. *Mixtures of various cereals.*

	" A. B. C." Cereal Milk.	Robinson's Patent Barley.	F. & R. Gluten Flour	S. & M.'s Best Food.
Moisture	9.33	10 10	....	[illegible]
Fat	1 01	0 97	....	0.40
Grape sugar	4 60	3 08	....	20.41
Cane sugar	15.40	0.90	....	9 08
Starch	58.42	77 76	....	36 36
Soluble carbohydrates	20.00	4.11	....	44 83
Albuminoids	11 08	5 13	....	9 63
Cellulose, gum, etc	....	1 93	....	....

16. " *A. B. C." Cereal Cream.* Stated to be " prepared from the most nutritious and digestible parts of the choicest wheat and barley, with all impurities removed." It appears to be a coarse meal of wheat and barley, but I did not analyze it, the box which I purchased being musty, mouldy and dark colored at the time it was opened. It presently became a living mass of maggots and was thrown away.

17. " *A. B. C." Cereal Milk.* " Prepared by a scientific admixture of the nitrates and phosphates of wheat with the whole of barley; and, after adding the required sugar, we have secured an analysis almost identical with human milk. The wheat is first cleansed, then hulled, coarsely ground and the surplus starch removed, leaving the nitrates and phosphates. The barley is hulled, crushed and mixed with a proper proportion of the wheat nitrates and phosphates. The mixture is cooked by steam, dessicated, ground into fine flour, specks bolted out and the requisite amount of sugar added."

The statement that this food corresponds nearly with human milk in its nutritive ingredients is untrue, as will be seen by comparison with the following analyses of human milk, the first giving the average composition with the natural percentage of water, the second the same composition reduced to agree with the percentage of water present in " A. B. C" Cereal Milk.

	Woman's Milk.	Same Reduced.	Cereal Milk.
Water	89.00	9.00	9.33
Fat	3.00	24.82	1.01
Sugar	5.00	41.36	20.00
Starch	none	none	58.42
Albuminoids	2.65	21.93	11.08
Salts	0.35	2.89	undet.

Instead of one-fifth its weight in fat, it has but one-twentieth this amount or one-hundredth. Instead of that peculiar modification of sugar especially adapted to infants' needs, milk sugar, it has a mixture of grape and cane sugar, and these in a very different proportion. Whilst milk has no starch, this consists of more than one-half starch. And apart from the fact that the albuminoids of the cereal milk are entirely different in character from the readily assimilable albuminoids which are present in human milk, their percentage is but half so great. In fact, this cereal milk does not contain so large a proportion of albuminoids as average winter wheat. It appears to contain a larger percentage of barley than of wheat, but there is nothing to show that there is a corresponding dietetic advantage. The mode of preparation is very objectionable, in so far as after steam-cooking it must be thoroughly dessicated in order to render it fit for handling in commerce. If it is not thoroughly cooked and dessicated, the animal life may not be destroyed and it may mould and putrefy as in the sample of cereal cream examined. If it is thoroughly dessicated after steam-cooking, as it would be by long-continued heating in dry air at 150°, it loses a large portion of the flavor and odor on which the palatability of the cereals depends, and its digestibility is so far diminished as to render it liable to pass through the intestines without digestion. If the cereal milk could be, as its name implies, a cereal brought by cooking into a state fit for immediate use, it would not be open to this objection, but the indigestibility connected with the subsequent dessication is a matter deserving of serious attention.

18. *Robinson's Patent Barley.* Patent barley, technically, is ground pearl barley. Yet this preparation, while possessing most of the characters of what it purposes to be, is somewhat unlike pure barley flour. Its dough is more adhesive, and the white color, together with the mild barley odor, suggests the admixture of wheat flour. No gluten-cells are seen, but there are numerous granules unaffected by iodine and turned red by carmine (albuminous matter.) The microscopic examination shows starch granules free and in bundles, held

together by the cellulose. The larger corpuscles are probably those of wheat. I have adopted this description of Dr. Fowler, although I am inclined, from my own observations, to regard the preparation as merely barley flour.

19. *Farwell & Rhine's Gluten Flour.* "A gluten flour, substantially free from starch. For dyspeptics, diabetics and invalids." This flour has evidently been prepared with much care, and the result is a very low percentage of cellulose, gum, etc. The amount of starch has not been diminished nor that of albuminoids increased to the extent aimed at by the manufacturers, though the results are all in a favorable direction. There is no matter about which manufacturers are more apt to form exalted hopes than concerning their laborious endeavors to increase the relative percentage of gluten in flour. And the discrepancy between the claims put forth and the results actually obtained, I am persuaded, is not due, as some would have us believe, to a general lack of honesty on the part of the manufacturers, but to the difficulties in effecting an elimination of the starch by the processes employed.

20. *Savory & Moore's Best Food for Infants.* Claimed to be the only food specially prepared for the use of infants, and to be far superior to the ordinary kinds of Liebig's food in promoting the healthful growth of children. These are false claims, and the use of Liebig's name in connection with this food appears to be unwarranted. It bears no resemblance to Liebig's food in its composition, containing, as it does, over 36 per cent. of starch. I have placed it with the foods prepared from a mixture of cereals, containing, as it does, both wheat and barley. When viewed as a prepared meal, it is worthy of commendation, inasmuch as the percentage of soluble carbohydrates representing the dextrine, cane and grape sugar is high, the percentage of starch about half that present in ordinary wheat flour and the percentage of albuminoids not far below that of ordinary wheat flour.

F. *Milk Foods.*

	Nestle's.	Anglo-Swiss.	Gerber's.	American-Swiss.
Moisture	4.72	6.54	6.78	5.68
Fat	1.91	2.72	2.21	6.81
Grape sugar	6.02	23.29	6.06	5.78
Cane sugar	32.93	21.40	30.50	36.43
Starch	40.10	34.55	38.48	30.85
Soluble carbohydrates	44.88	46.43	44.76	45.35
Albuminoids	8.23	10.26	9.56	10.54

On account of various objections to Liebig's Food, the attempt was made to supply a food which should contain the constituents of milk to a certain extent and yet should be free from the objections to which condensed milk is open. The attempt was first made by H. Nestlé, in Vevey, Switzerland, but at the present time many milk factories are in existence, including one in our country at Little Falls, New York, under the management of Dr. N. Gerber. All of these milk foods consist of cereals specially prepared in combination with milk. The preparation of the Anglo-Swiss Milk Food is stated to be as follows: Twenty parts of Russian wheat flour and twenty parts of oat-meal are made into a dough and baked. The biscuit is then ground fine, mixed with sixty per cent. of condensed milk, dried by a slow heat at 120° to 130°, ground and sufficient wheat gluten added to bring up the percentage of albuminoids to the same amount as that present in human milk. It is evident, that apart from giving a general idea of the method of manufacture, this statement cannot be regarded as correct, inasmuch as the percentage of fat in the Anglo-Swiss Milk Food analyzed is much less than that which would be imparted by sixty per cent. of condensed milk. The percentage of albuminoids likewise makes it doubtful whether any albuminoids in addition to those present in the milk and flour have been added in the form of specially prepared wheat gluten.

According to Dr. N. Gerber, (Milk Analysis, p. 70,) the various milk foods in the market vary in composition as follows:

		Average.
Water	5.0 to 10.0 per cent.	7.50
Salts	1.5 to 3.0 "	2.25
Fat	4.0 to 7.0 "	5.50
Albumen	9.5 to 18.0 "	13.25
Soluble carbohydrates	35.0 to 55.0 "	45.00
Insoluble "	15.0 to 35.0 "	25.00
Cellulose	0.5 to 1.0 "	0.75

It will be noted that Nestlé's Food departs farther from the average than any of the other preparations, and the American-Swiss approaches most nearly. The percentage of fat in the latter is much larger than in the other preparations, and the percentage of the albuminoids is likewise the greatest. On preparing these various brands, the Nestlé's, Anglo-Swiss and Gerber's were very palatable and delicate in their flavor, more so than the American-Swiss, which had a slight rancidity, connected, no doubt, with the large percentage of fat

and fatty acids. Under the microscope various milk foods had a similar appearance, exhibiting agglomerations of starch granules, globules of milk. They all gave the starch and dextrine reaction with iodine, the reaction for dextrine being stronger in the Gerber's than in the Anglo-Swiss. All had a faintly acid reaction except Nestlé's, which was slightly alkaline.

All of them have the same points in their favor, a high percentage of albuminoids, fats and salts, this being especially true of the American-Swiss. The conversion of the starchy matters into dextrine by previous baking, gives to this class of infant foods the advantages of that class of prepared cereals which have been rendered easily assimilable by a process of previous torrefaction. The addition thereto of condensed milk has both advantages and disadvantages. The advantages are, that the condensed milk is milk in a pure and safe form. Instead of being coagulated in large cheesy masses in the child's stomach, as would be liable to be the case if the condensed milk, after thinning with water, were given alone to the infant, the admixture of dextrine and torrefied milk keeps the caseine divided and causes it to form in small flakes more nearly analogous to those forming from woman's milk. The condensed milk likewise adds a noteworthy percentage of fat, which is conspicuously absent from the other infant foods. It also adds a certain amount of milk sugar and increases the percentage of albuminoids and valuable saline matters, more especially the phosphates. The principal disadvantage is, that condensed milk is preserved with the aid of cane sugar, its analysis being as follows:

Water	20.0 to 30.0 per cent.
Salts	1.5 " 3.0 "
Fat	8.0 " 12.0 "
Albuminoids	10.0 " 13.0 "
Milk sugar	10.0 " 15.0 "
Cane sugar	30.0 " 45.0 "

Cane sugar, therefore, being relatively by far the largest constituent, there soon arrives a point in the manufacture of milk food when the addition of condensed milk must cease, otherwise the percentage of cane sugar, which, like other carbohydrates, is very objectionable when it takes the place of a proper amount of albuminoids, would become excessive and indigestion thereby be induced in the infant using such food. The remedy, it appears to me, would be found by using a condensed milk preserved without the use of cane sugar, and since this

can now be successfully effected by means of Appert's method, the preparation of a milk food not open to the above objection should be soon satisfactorily accomplished. In that case we should have an infant's food with a very high percentage of albuminoids and a low percentage of carbohydrates. The sugar would be present in the form of milk sugar derived from the milk and as grape sugar derived by a process of torrefaction from the meal. The last, in its turn, would not have to be present in larger amounts than what are requisite to supply the starch and dextrine, which are of use to prevent coagulation of the caseine in large flocks.

G. *Liebig's Infant Food.* It is not necessary to discuss here the evidence by which physiologists have established the fact that in the earlier stages of infancy only very small amounts of starch can be digested. But, accepting this fact, it is our present purpose to discover how far the difficulty has been overcome in the case of any of the infant foods. In so far as the starch was rendered soluble and converted into glucose and dextrine, the various baked farinaceous preparations were commendable. But inspection of their analyses shows that even in the most successful cases this conversion is but partial. In order to render it complete, Baron Liebig proposed to resort to a chemical process and to transform the starch into saccharine under the influence of the diastase contained in malted grain.

The following is the best way of preparing this food: Half an ounce of wheaten flour and an equal quantity of malt flour, seven grains and a quarter of bicarbonate of potassium and one ounce of water are to be well mixed; five ounces of cow's milk are then to be added, and the whole put on a gentle fire. When the mixture begins to thicken, it is removed from the fire, stirred during five minutes, heated and stirred again till it becomes quite fluid, and finally made to boil. After the separation of the bran by a sieve, it is ready for use. By boiling for a few minutes it loses all taste of the flour. (*London Lancet*, Jan., 1865, quoted in Diseases of Children, Dr. J. L. Smith.) The objections to this formula are that while it requires no more skill and practical knowledge than parents should have, yet, as a matter of fact, many mothers are lacking in both, and the operations of straining and of heating to a proper temperature, which, as a matter of fact, should not exceed 150° F., about which temperature diastase undergoes decomposition, would either not be properly performed or the necessity of resorting to the labor would effectually deter the nurses from preparing Liebig's foods. For these reasons its prepara-

tion has fallen into the hands of manufacturers, and it is claimed by them that the husk is carefully freed from the malt and the malt finely ground, that the wheat flour is lightly baked prior to use and the conversion of the starch, under the influence of diastase, is watched with the aid of a thermometer. The composition of the three varieties of Liebig's Food principally sold in this country, is given in the following table:

	Horlick's.	Hawley's.	Mellin's.
Moisture	3.39	6.60	5.00
Fat	0.08	0.61	0.15
Grape sugar	34.99	40.57	44.69
Cane sugar	12.45	3.44	3.51
Starch	none.	10.97	none
Soluble carbohydrates	87.20	76.54	85.44
Albuminoids	6.71	5.38	none.
Insoluble residue	2.62	....	9.41

All of these are dry foods in brown or yellow masses and very sweet, the Mellin's food looking and tasting very much like pulverized molasses candy. Their aqueous solutions, besides this sweet, had an after taste of alkaline salt. Under the microscope, Horlick's food exhibited very few starch granules, some cellulose, hairs of wheat, but mostly dark bundles of entirely unrecognizable granular matters, probably converted starch. Mellin's food goes almost entirely into solution and I failed to recognize under the microscope the minute irregular granular matter left behind. The materials sent to me by the manufacturers of Horlick's food, as representing their regular consumption, consisted of fine white wheat flour not baked, good barley malt and pure bicarbonates of potash and soda. Singularly enough, the reaction of the Horlick's food analyzed was acid. That of the Hawley's food was acid likewise, while the Mellin's food was alkaline.

The analyses reveal certain striking points in connection with these Liebig's foods. The percentage of fat is extremely low, that of grape sugar very high. In Horlick's and Mellin's there is no unconverted starch, in Hawley's 11 per cent. In Mellin's there were no albuminoids and in both the others the percentage was very low, that in Horlick's, the larger, being but 6.71 per cent. I fail to understand the entire absence of albuminoids in Mellin's food, the only ready explanation, which is that neither wheat nor barley malt was used in the preparation, being one which I am loath to entertain. From its

analysis, it would appear to contain but little else except 46 per cent. of sugar, nearly as much dextrine, saline matters and insoluble residue.

The objectionable feature in all this class of foods is their extremely low percentage of albuminoids as compared with the carbohydrates. This objection would be fatal to their continued use, unless when accompanied by a sufficient amount of milk to change entirely the relative proportion of their ingredients. This being the case, and the required amount of milk being large, their quality as food would largely depend upon the quality of the milk used in connection with them.

UNCLASSIFIED.

27. *Keasbey's and Mattison's.* The advertisement states that this is an extract prepared from malted grain, consisting of grape sugar, dextrine, alkaline phosphates, etc., and that it is perfectly free from starch. It does not resemble the various preparations of Liebig's foods in the market, although in composition most nearly approaching them. It has, as the advertisement states, no starch, but at the same time does not contain any albuminous matter, and this is inexplicable in case malted grain were used in its preparation. The amount of grape sugar contained in it is very large. It gives the reactions for dextrine and has a very sweet taste, resembling both in taste and appearance some variety of molasses or syrup. Its reaction is neutral. It contains:

Moisture	27.95	per cent.
Fat	none.	
Grape sugar	36.75	"
Cane sugar	7.58	"
Starch	none.	
Soluble carbohydrates	71.50	"
Albuminoids	none.	
Insoluble residue	0.55	"
Salts	0.92	"

ANALYSES OF INFANTS' FOOD.

	Moisture.	Fat.	Grape Sugar.	Cane Sugar.	Starch.	Soluble Carbohydrates.	Albuminoids.	Gum, Cellulose, etc.	Insoluble Residue.	Total.	Reaction.
Baby Sup, No. 1	5.54	1.28	2.20	11.70	61.99	14.35	9.75	7.09	....	100.00	Neutral
Baby Sup, No. 2	11.48	0.62	2.44	2.48	51.95	22.79	7.92	5.21	....	100.00	Slightly alkaline.
Gerber & Co.'s Milk Food	6.78	2.21	6.06	30.50	38.48	44.76	9.56	....	....	101.79	Slightly acid.
Ridge's Food for Infants	9.23	0.63	2.40	2.20	77.96	5.19	9.24	....	....	102.25	Neutral
Victor Baby Food	7.49	1.62	0.62	19.92	63.45	20.54	8.47	....	....	101.97	Slightly acid.
Anglo-Swiss Milk Food	6.54	2.72	23.29	21.40	34.55	46.43	10.26	....	....	100.56	Slightly acid.
Horlick's Food for Infants	3.39	0.08	34.99	12.45	none.	87.20	6.71	....	2.62	100.00	Slightly acid.
K. & M. Infants' Food	27.95	....	36.75	7.58	none.	71.50	none.	....	0.55	100.00	Neutral.
Nestlé's Milk Food	4.72	1.91	6.02	32.93	40.16	41.88	8.23	....	0.08	100.00	Slightly alkaline.
Hawley's Liebig's Food	6.00	0.61	40.57	3.44	10.97	76.54	5.48	....	....	100.10	Slightly acid.
Hazard's Graham Farina	9.12	0.81	2.19	2.49	60.68	6.35	8.48	5.56	....	100.00	Neutral.
Cereal Milk	9.33	1.01	4.60	15.40	58.12	20.00	11.08	....	....	100.16	Slightly acid.
Mellin's Food	5.00	0.15	44.69	3.51	none.	85.44	5.25	....	3.46	100.00	Slightly alkaline.
Blair's Prepared Wheat Food	9.85	1.56	1.75	1.71	64.80	13.69	7.16	2.94	....	100.00	Neutral.
Savory & Moore's Infants' Food	8.34	0.40	20.41	9.08	36.36	44.83	9.63	0.44	....	100.00	Neutral.
Hubbell's Prepared Wheat Food	7.78	0.41	7.56	4.87	67.60	14.29	10.13	undet.	....	100.21	Neutral.
American-Swiss Milk Product Co	5.68	6.81	5.78	36.43	30.85	45.35	10.54	0.77	....	100.00	Acid
Wheat Flour for Hubbell's Wheat Food	9.02	1.01	2.34	2.46	76.07	5.66	6.40	....	....	....	Neutral
Imperial Granum	5.49	1.01	trace.	trace.	78.93	3.56	10.51	0.50	....	100.00	Neutral
Robinson's Patent Barley	10.10	0.97	3.08	0.90	77.76	4.11	5.13	1.93	....	100.00	Neutral.
Farwell & Rhine's Gluten Flour	12.67	0.84	2.23	1.42	68.36	7.23	10.39	0.51	....	100.00	Neutral.

CONCLUSIONS.

It will be manifest, I think, from the foregoing results and remarks that I have arrived at conclusions quite different from those authors who would severely condemn all the very numerous kinds of infants' foods at present manufactured, and who would stigmatize the manufacturers as dishonest in their representations and in their goods. Neither am I able to agree with the statements found on so many of the labels, that certain foods are the only or the best possible infant foods. I am impressed with the very great amount of study and labor which most of these manufacturers have expended, and what I have to say in the way of objection is based not so much upon the shortcomings of manufacturers as upon certain imperfections unavoidable in particular classes of foods. To recapitulate, these classes are three in number: The prepared farinaceous foods, the Liebig's, and the milk foods. The first variety are in no case, and cannot be by any process of cooking or baking at present known, so far altered in composition that the largest portion of their starch is converted into sugar and dextrine. They are, of necessity, mainly starch, and for this reason are not well adapted for infant food. The Liebig's foods are very deficient in albuminoids. Two of them are entirely without albuminoids, the Mellin's and the Keasley & Mattison's, and they should be made better to conform to Liebig's standard. The Liebig's foods are excessive in the amount of carbohydrates, and this excess of saccharine matters, etc., must still exist even after the addition of milk. They cannot be made in this way to exhibit such a ratio of carbohydrates to albuminoids as exists in human milk. The third class, the milk foods, has about half the amount of starch which is present in the first class and about the same amount of albuminoids. It is open to the great objection that its ratio of saccharine matters to the albuminoids is still too high. Whilst the market supplies us many more or less excellent infant foods, one not open to these objections and entirely satisfactory has yet to be made.

REPORT OF WILLIAM K. NEWTON, M. D.,

ANALYST AND MILK INSPECTOR.

Dr. E. M. Hunt, Secretary State Board of Health:

DEAR SIR:—I herewith transmit my third annual report:

The law for the prevention of the adulteration of milk was very much changed by the Legislature this year, and was revised and passed under a new title. The alterations made in the law of 1881, by the new act, are as follows: The mark on cans containing skimmed milk was required to be of metal and the letters thereon to be at least two inches high; the standard of total solids was reduced from thirteen per cent. to twelve per cent.; the method of making complaints and conducting trials was defined and made clear; the Inspector was authorized to appoint assistants at a salary of not more than five dollars a day. The most important change, however, was the introduction in the law of a plan for disposing of the samples of suspected milk before a complaint was made against persons violating the statute. This plan is as follows: the Inspector is required to take a sample, seal it up in a suitable vessel in the presence of a witness and transmit it to a member of the Council of Public Analysts. This takes all responsibility away from the Inspector and the burden of proof of adulteration lies with the chemist.

The new law has worked well but less rapidly than the old one; many cases have been passed over because of the difficulty of obtaining persons willing to act as witnesses to the sealing of the sample, and I have been compelled, in a number of instances, to require the dealer to be a witness.

I have appointed but three assistants, under the law, for the following reasons: my desire has been to keep the running expenses of my

department at a minimum, and I did not want to open the door to a long list of salaried assistants; and thoroughly honest and capable men, who are willing to do the work in a proper manner, are hard to obtain.

In Newark, Mr. Henry Negles was commissioned an assistant, without pay, and placed under orders from Dr. F. B. Mandeville, health officer of that city. Mr. Negles was well drilled by me in the duties of milk inspection, and when I deemed him competent was placed in charged of the work in Newark.

At no place outside of New York city has such a vigorous warfare been waged against dealers in impure milk as that carried on in Newark. At least seventy complaints have been made in that city and Mr. Negles is to be congratulated on his success and the city of Newark may well be proud of so efficient and capable an officer.

Dr. Edgar Everhart, of Hoboken, was appointed assistant for Hudson county, on a reasonable salary. He has done telling work in Hoboken and Jersey City.

Mr. Peter Vandegrift was commissioned for the southern and western part of the State, and is at work under my orders and to aid the local authorities.

I have personally visited nearly all the dairy sections of the State, but as a detailed account of the work done would be a repetition of my last report, I do not think it necessary to lengthen this report by relating it.

Eighteen complaints against persons engaged in selling impure milk have been made by me and they have been disposed of as follows: seven persons have been discharged by the courts on account of mitigating circumstances, they paying all costs of court; six have been fined fifty dollars each; five cases are still pending in the courts.

The arrangements made with analysts have been very satisfactory, and the terms agreed upon are advantageous to the State. The fees accepted by these gentlemen are so low that love for the work, and a desire to aid the authorities, must have been the only motives.

The law has proved of great value to the milk producers of Sussex, Hunterdon, Passaic, Morris, Essex, Somerset and Middlesex counties, and has assisted them in making better terms with the dealer and consumer. As the enforcement of the law has kept out of market large quantities of impure and impoverished milk, the pure article has been able to command a better price. In the above-mentioned counties, I am assured by all honest dairymen that the law has been a great

boon to them, and, as at least two-thirds of the milk produced in the State and used as food comes from these counties, we may claim that. the majority of producers are satisfied with and are in favor of the law

I am sorry to say that the producers in the western section of the State are not yet satisfied with the statute and still think it harsh in its operation. Hardly a complaint is made against an offender in that part of the State without the cry of oppression being raised. I can only account for this dissatisfaction by assuming that there are false prophets or ill-advised agitators misleading the dairymen.

I may be pardoned for re-opening the discussion of the vexed skimmed milk question, if the importance of that question is understood. The section in our law allowing the sale of skimmed milk, if the cans are properly marked, was thought by some to settle the matter and to prevent fraud, but the tag or label is now used by shippers to mislead inspectors. Large quantities of impoverished milk are sent to market in legally-marked cans and sold to consumers as pure milk. Permission to sell this fraudulent article is but permission to defraud the public. I venture to say that the sale of skimmed milk would be reduced to a very small quantity indeed if the public knew what it was purchasing. I can see no method of checking fraud in our milk supply and at the same time enabling our farmers to get a living profit out of the milk they raise, if skimmed milk is allowed to be sold; and I am fully persuaded that the radical measures adopted in New York are the best for the public.

I will in closing reiterate what I have many times written in reference to our milk law, and that is, I am of the opinion that the food adulteration law is fully competent to cope with the adulteration of milk, and the Inspector should be required or authorized to make his complaints under that law.

Paterson, December 28th, 1882.

Respectfully submitted,

WM. K. NEWTON, M. D.,

State Inspector of Milk.

CIRCULARS AND LAWS SINCE JANUARY 1, 1882.

CIRCULAR F (XXVI.)

As to Contagious Diseases of Animals.

In addition to diseases already noted in the five former circulars of this Board, a few others have attracted our special attention because of their occurrence to a greater degree than usual in this State.

DISEASES OF HORSES.

An epizootic, or general influenza among horses, has prevailed at various times in different countries. It has never prevailed so extensively in this country as it did in 1872–3, when, like a traveling epidemic, it commenced in Canada and proceeded with quite equal pace toward the south until it extended over the entire United States and Mexico. While its origin is unknown, its communicability seemed to be established from the fact that horses escaped on those islands to which others were not brought from the mainland, and that animals kept away from others and not brought out of their stables, sometimes escaped. The best account of the epizootic and of its methods of treatment, is to be found in the history of it by Dr. A. B. Judson, Professor Andrew Smith, and Professor A. F. Liautaud, as contained in Vol. I. of the "Reports and Papers of the American Public Health Association," pages 88–109, and in the paper of Prof. James Law, as contained in the Report of the Department of Agriculture (U. S.) for 1872.

There was a slight recurrence of the disease in some parts of the United States in 1881–2, and in localities in this State it was quite common, although generally in a much milder form. It is a disease which has great variations in severity and in its class of symptoms

and lesions. From the fact that the mucous membrane of the eye, in sympathy with that of the pulmonary organs, is often pink with a tinge of brown or yellow, it is frequently know as "pink eye." This was its more common name as it prevailed with us the last season. About the same time it prevailed extensively in Glasgow and other parts of Scotland. The following outline and treatment of the disease as given by W. M. Anderson, Jr., before the Scottish Metropolitan Veterinary Medical Association will serve as a valuable guide:

"The disease presents itself in several forms, which may be classified under four heads, viz., Catarrhal, Œdematous, Rheumatic, and Irregular. In all four forms the primary symptoms are alike, namely, dullness and languidness, then loss of appetite. At this stage we can, as a rule, determine what form the disease will assume. If Catarrhal, the animal has a slight cough, tumefaction of the submaxillary glands, with watery discharge from the nostrils, and the usual febrile symptoms, namely, increased temperature and rapid pulse; the conjunctiva has a yellowish appearance, and all the mucous membranes visible are injected. The pulse is seldom over eighty, more frequently ranging from fifty-five to sixty-five, the temperature varying from 101°-105° Fahr.

"I consider the disease takes four days, as a rule, to mature, at which stage the foregoing symptoms are increased. The previously injected mucous membranes become yellow; the animal gets very weak, in fact, staggers greatly; rapid emaciation sets in, still there is no inclination to feed, and it seldom lies. This state of matters generally continues for two or three days before convalescence sets in. The first convalescent symptoms are the eye brightening up and the animal showing an inclination to feed. It is astonishing how soon the patient recovers after convalescence sets in; the symptoms disappear as rapidly as they appeared, and in a few days the animal is apparently in good health. The fatal terminations of this form of the disease are generally due to pleurisy or gangrene of the lungs. When the disease assumes the Œdematous form, after the primary symptoms the eyelids swell, then the legs—more especially the hind ones—tumefy considerably, and the sheath, as a rule, is greatly swollen. There are the usual febrile symptoms, with quick, weak pulse, and urine high colored, and often, but scantily, passed.

"The mucous membrane is infiltrated with a yellow fluid; there is great thirst, but no inclination to feed; rapid emaciation sets in, and in a number of cases diarrhœa is present. This form of the disease also takes about four days to mature, The eyelids are then completely closed, the pulse generally ranging from eighty to one hundred, the temperature from 102° to 105°. As a rule several days elapse before convalescence sets in, and recovery is much slower than in the preceding form. Should death take place, it is generally through sheer prostration.

"In the Rheumatic form, which I must say is the most peculiar, we have loss of appetite and the mucous membrane injected; there is great lameness in one or more limbs, oftenest in the off fore, without any apparent cause. The animal has an anxious look, as if suffering acute pain. The febrile symptoms are present, accompanied by an intermittent pulse; the lameness sometimes changes from one limb to the other; the back is in some cases 'roached,' and when the animal is moved it generally inclines to one side or the other. There is a difficulty in micturition, and the urine is highly colored. This form takes about ten days to run its course; and

often the lameness continues for several days after the other symptoms have disappeared.

"The fourth form, which I have called 'Irregular,' includes all the complicated forms of the disease. The usual symptoms of fever and jaundice are present, but in some cases we have diuresis accompanying them, in others partial paralysis, again in others colicky pains, all of which require different treatment, according to their respective symptoms. I cannot say much regarding the *post-mortem* appearances of this disease, as I had only one opportunity of witnessing an examination of a horse which was said to have died from the disease, and from all appearances emaciation was the cause of death. However, the mucous membrane all along the intestinal track was infiltrated with a yellow fluid, and the liver was enlarged. My treatment for this disease of course varied according to the symptoms present; but in every case in which fever existed the first thing I did was to rub the whole surface of the body with *acetic acid and water*. If the animal had a fine skin I mixed one part of the acid with two of water, but with draught or coarse-skinned animals I used equal parts. After rubbing the body and legs with this mixture, I ordered the animal to be well wrapped up in several blankets, from the head backwards, and the limbs to be bandaged; I also put half an ounce of nitrate of potash and fifteen minims of Fleming's tincture of aconite in half a pailful of cold water, and allowed the animal to drink it as he pleased. After the blankets had been on an hour I had them removed, and usually found the animal perspiring profusely. Having had him rubbed dry, and applied soap liniment to his throat and region of the liver, dry blankets and bandages were put on, and he was removed to a comfortable box or stall. The only food I allowed him was a few *sliced carrots*, mixed with some wet bran, and a handful of oats three or four times a day. In the Catarrhal form I generally applied the liniment to the throat twice a day, and in a few cases had to blister the throat with cantharides. I kept water with aconite and potash constantly before him, allowing him three to five doses in the twenty-four hours. However, after the first administration I limited the dose to two drms. nit. potass., and ten mims. aconite. If the fever continued, without showing signs of abatement, twenty-four hours after my first visit, I again applied the acetic acid and water.

"When I feared the disease extending to the chest I applied a counter-irritant, and gave sulph. ether two ounces, and camphor two drms., twice daily. In the Œdematous form, besides applying the acetic acid and water to the body, and the liniment to the throat and region of the liver, I ordered his legs to be rubbed with mustard and water, the strength being one-quarter pound of mustard to a gallon of water, and then bandaged. I also gave mineral tonics in the form of balls.

"In the Rheumatic form I gave two drms. salicylic acid twice daily and applied acetic acid to the affected limb or limbs. In the Irregular form my treatment, of course varied. When diuresis was present I substituted carbonate of soda for nitrate of potash, and gave plenty of mashed linseed, also occasionally giving two drms., iodide of potassium. When partial paralysis presented itself, I gave sulph. quinine and nux vomica. My opinion regarding the treatment of this disease is, that good nursing and comfort have more to do with the recovery of the patient than all the medicine we may prescribe."

PREVENTION OF CONTAGIOUS DISEASES.

Two points in respect of the contagious diseases of animals still need to be urged upon farmers and dealers. Because they are animals the

laws of their well-being are definite and precise. If they are badly reared, ill-fed, badly kept, and if allowed to live amid their own filth, when it is in a state of decomposition or putridity, or to drink of water that is polluted, it is to be expected either that they will not thrive or that pestilences will occur. With swine especially, it is now quite well known that most of their diseases are primarily the result of enforced filthiness, and some of the diseases of other animals have a similar origin. Next, it is to be remembered that most of these communicable diseases among animals are transportable, and so arise by contact with diseased animals or with their secretions. As droves of cattle in course of conveyance, or while kept in city stock yards are greatly *exposed, it is never wise to place unknown and newly purchased animals with the general herd or flock, or in adjacent stalls until at least thirty days have elapsed. Even longer where any contagious disease prevails.*

INOCULATION FOR PLEURO-PNEUMONIA.

Within the last year an important paper has appeared on inoculation as a preventive of pleuro-pneumonia by R. Rutherford, M. R. C. V. S., of Edinburgh, which seems greatly to encourage the hope that some former risks are removed, and that when properly performed, we possess in it a means of limiting the prevalence of this destructive disease. His paper is contained in the June and July numbers (1882) of Fleming's Veterinary Journal. He states his conclusions in the following summary: 1-10, *see page* 30, *Veterinary Journal, July*, 1882.

"1. Inoculation is based upon the theory of pleuro-pneumonia being an eruptive fever.

"2. Inoculation is the application to a healthy animal of the virus of pleuro-pneumonia.

"3. Inoculation does not produce pleuro-pneumonia

"4. An inoculated animal does not infect another animal.

"5. An inoculated animal cannot contract pleuro-pneumonia.

"6. The time occupied by the operation is from four to eight weeks.

"7. Inoculation in the case of milch cows does not materially interfere with their milking.

"8. Inoculated animals thrive better after the operation, and are stronger and freer from other ailments than those not inoculated.

"9. The loss arising from the operation need not exceed two per cent.

"10. From the fact that an inoculated animal is exempt from the disease, and that the average time required to develop and mature an inoculation is from fourteen to twenty-one days, that period may be accepted as the time required to arrest an outbreak."

He insists upon exact methods of procuring, preserving and inserting the lymph. His success fully justifies the provisions of our present law, while it shows the inadequacy and danger of the operation in unskillful hands.

In the April Veterinary Journal of 1882, its editor, George Fleming, F. R. C. V. S., says:

"By a long-continued series of experiments on animals, Dr. Willems, of Hasselt, Belgium, has succeeded in perfecting a method of protective inoculation, which is certain in its results. Further experiments with the cultivated germs of the virus are now being carried on with a view of obviating troublesome accidents which sometimes accompany the inoculation, and with every prospect of success."

The same distinguished authority, in reply to an inquiry addressed to him by this Board, says:

"Inoculation as a protective measure for bovine contagious pleuro-pneumonia, has been, and is now most extensively practiced on the continent of Europe and in this country, and there is no evidence that inoculated animals, while suffering from the immediate effects of the operation, can communicate the disease. There is only one such instance recorded (it is given in the Vet. Sanitary Science and Police,) but the circumstances attending it throw great doubts upon its correctness. I, myself, discredit it. I have absolute faith in the effects of the operation as a prophylactic measure, and would most certainly counsel its adoption where the disease prevails, subject, of course, to suitable precautions as to the time and manner of performing the operation. This should be as carefully attended to as vaccination is with children."

ANTHRAX OR SPLENIC FEVER.

Since the cases of *malignant anthrax*, or splenic fever, in Salem county, a few similar cases are thought to have occurred in Hudson county. The seriousness of the disease is shown by its ravages in some European countries, and especially in Russia. Prof. Tyndall informs us that in the single district of Novgorod, in Russia, between the years 1867 and 1870, over 56,000 cases of death by splenic fever among horses, cows and sheep were recorded. Nor did its ravages confine themselves to the animal world, for during the time and in the district referred to, 528 human beings perished in the agonies of the same disease. The causes and cure of the malady are well summed

up by Prof. Law in an article in the second report and papers of the A. P. Health Association, page 467: "The most universally acknowledged causes of the malady in animals are plethora, or a state of blood highly charged with organic elements, an impervious soil or subsoil for pasturage, a very rich surface soil, inundations, a period of heat and dryness, calculated to foster decomposition of organic matters to a great depth in the ground, and a great contrast between the night and day temperatures. * * * While this affection is communicable to animals by inoculation, it can scarcely be said to spread in any other way, and is, therefore, to be looked upon as essentially an enzöotic disease. We must go to such places as the inundated margins and deltas of large rivers, dried-up lakes and marshes, or the rich and pestilential Russian steppes, to find any approximation to the disastrous outbreaks in man and beast which blacken the history of past ages." What was done in the cases reported by Prof. Law to check the disorder, remains to be noted. One hundred of the best steers were turned on a higher pasture with a gravelly subsoil. The remainder were, of necessity, left in the higher of the two meadows formerly occupied, but were fenced out from the swamps and low meadows where the clay approached near to the surface. Antiseptic methods of treatment were used, and most of the cattle recovered. In the cases occurring in Salem county, the bacillus anthracis was detected.

TEXAS, OR SOUTHERN CATTLE FEVER.

This is generally regarded as allied to anthrax or splenic fever. Its classification cannot be said to be settled. It is not believed that it has the same law of contagion as the malignant anthrax of Europe, or as similar outbreaks which occasionally occur in this country.

The disease, although communicable, is not regarded as contagious in the general sense. D. E. Salmon, D. V. M., a veterinarian of the National Agricultural Department, says:

"The real danger exists in the pastures or other grounds over which Southern cattle, whether sick or well, have traveled." If other cattle are turned in the same pastures or go along the same roads, they are liable to contract the disease. The sick animal does not, because of his sickness, impart the disease, but the apparently well Southern cattle seem to carry the contagion of the disease, and will impart it to the pastures in which they feed, or the roads on which they travel, although, even afterward, not showing it in themselves. It is even claimed that a sick Southern animal does not infect the

pastures, while those from the South, which have sickened by pasturage or by driving on fields or roads infected by apparently well Southern cattle, do infect them. This would suggest the idea that it is only at a certain stage that the infective particle is transmissible. Also, it is believed that Northern cattle, which have contracted it through road-driving or pasture, will not impart it to other cattle, either directly or by means of pastures. We cannot yet regard the history of this contagion as so definitely settled. Two outbreaks, confined to Texas cattle brought into this State, have occurred this year—one in Salem county and one in Burlington county. No extension of the disease has occurred. It is therefore important to state what is to be done in such case, both so as to exercise due precaution and to avoid unnecessary alarm.

The sick Southern cattle should be "quarantined upon the infected pasture," where they cannot come within one hundred feet of other animals. They should be securely fenced upon the infected pasture until after a killing frost. Such as die should be buried beyond the reach of dogs. The question of slaughter must be left to local authorities, but, by most, this is not considered necessary in order to check the extension of the disease. Until more settled views are entertained, we recommend the same course in case of native cattle which may have contracted the disease. It is not necessary to quarantine all the cattle, but only those sick and the fields in which they are. Purchasers of Southern cattle should not allow other cattle, until after severe frosts, to be upon or go over the same ground on which they are left. It might become necessary for a township to prohibit the bringing in of any cattle from districts infected with Texas fever. The danger is the more insidious from the fact that the ground over which they pass or the excretions they leave upon it impart the disease. The "ticks" which are found upon the cattle may help in determining whence they came, but they have no relation to the disease.

There is no specific treatment known for the disease. The usual course of veterinarians is to give oils or mucilaginous drinks and nitre, or some other form of diuretic, to relieve the dryness of the fourth stomach and the congested state of the alimentary tract, the congestion of the liver or spleen, and the bloody urine. Where there seems to be much pain, opium is freely administered. Many recover, but the relation of treatment to their recovery is not always known.

The meat of any animal affected with the disease is not fit for use. It shows putrefactive changes so marked as not even to be classed with the meat of some of the more diffusive contagions.

The former circulars of the Board contain information as to all the other communicable diseases which have occurred in the State for the past year.

NOTE.—Copies of all these circulars, in pamphlet, can be had by postal addressed to State Board of Health, Trenton.

Trenton, January 4th, 1883.

CIRCULAR XXVII.

As to Sanitary Instruction and Training in Schools.

At its last session, the Legislature of the State of New Jersey, in Chap. CLXV., Sec. 2, enacted the following provision:

And be it enacted, That the State Board of Health shall be directed to confer with the trustees of the State Normal School as to definite instruction to be given in the practical care of the health of teachers and pupils, and as to provisions for such instruction.

At a meeting of the New Jersey State Board of Health, held at Trenton, the subscribers to this circular were appointed a committee to endeavor to secure in the public schools of this State such instruction in Physiology, Hygiene and Sanitary Science and Practice as shall most efficiently carry out the objects for which the Board was established, viz., the health, the happiness and the prosperity of the people of the State. To this end, we appeal most earnestly to all who are interested in the educational work of this State. State and local Boards of Education, trustees of the State Normal School, of colleges, academies, seminaries and of local districts, State, county and city superintendents, principals and teachers in all our institutions of learning are asked to consider most seriously and aid most effectually in instituting and carrying out a scheme for such instruction as we have indicated.

We would call your attention to the fact that the primary object of the public school system of the State is to secure good citizenship. There can be no complete citizenship without a knowledge of and obedience to the laws of one's own being and the laws of society—civil, sanitary and social. With these, it is safe to say, we shall secure among all classes of the community the best health, the highest productivity — moral, intellectual and physical — and the greatest amount of well-being and happiness. We would remind you that,

hitherto, the laws of one's own being and those of communities, constituting the great body of facts known as hygiene and sanitary science, have been very much neglected in the usual course of public instruction in this State. Thus the young have been permitted to grow up exposed to all the dangers to life and health, which follow inevitably the disobedience of nature's laws.

Is it not practicable that some of the time now spent in teaching branches of knowledge indirectly or remotely serviceable to the learner might, more profitably to the pupil and to the State, be devoted to imparting such knowledge as must needs be practically useful every day and hour of one's life?

Is it not equally evident that the kind of knowledge which contributes directly to the maintenance of health and vigor of body and mind, the prolongation of life and the fullest development of all the faculties in a complete and perfect manhood and womanhood, must be second in importance to none other?

If this be true, is it not equally clear that instructions in such should be as systematically and thoroughly given in all grades of schools as upon any other subject? Admit these propositions, and you will agree that we need to modify, as speedily as possible, our scheme of education.

It need hardly be said that the change, to be effectual, must be radical. Teachers must be, themselves, taught. Should not the Normal School begin this work soon and thoroughly? Teachers' institutes should make it a prominent part of each meeting. State, county and city superintendents should unitedly bring to bear all their influence to secure it a place in the regular course of study in the schools under their charge, and to stimulate the teachers to give their best efforts to make it as thoroughly practical, as it will be intensely interesting when properly pursued. Boards of trustees, upon whom now devolves the duty of determining the studies to be pursued in their respective districts, should at once take steps to introduce this, the most important of all, into the course, and by faithful oversight see that it is adequately and properly taught. Not by occasional lectures here and there before bodies of teachers, not by bits of advice to pupils on the part of well-meaning and well-informed teachers can this work be properly done, but only by systematic, oral and text-book instruction, as faithfully and persistently pursued as possible, and adapted to the ages and capacities of the pupils. It need hardly be said that the subject is broad enough and deep enough to

engage the profoundest thought of the foremost scientific minds of the world; yet, its facts are the facts of every-day life, many of them so simple, so clear, as to be readily taught and practiced.

With this instruction, so adapted to all ages and capacities, we would combine physical exercises, varied, beautiful and practical, fitted to develop the bodies and strengthen the minds of the growing pupils. Thus they will secure, as the limited time they have been under training will allow, knowledge immediately serviceable in the battle of life, and bodies well fitted to put it to practical use.

The Board will cheerfully furnish names of text books suited to various grades of schools, by means of which a beginning in these subjects may be made, and when once introduced, the demand for adequate instruction will, as in England, produce multitudes of works from which the teacher may select those best suited to inculcate this needful knowledge and to train pupils in its practice.

Trenton, August 21st, 1882.

L. DENNIS,
F. GAUNTT,
E. M. HUNT,
Committee.

CIRCULAR XXVIII.

Sanitary School Circular of the New Jersey State Board of Health.

The State of New Jersey in its free school system makes it obligatory upon all children, between five and eighteen years of age, to attend school. It claims that the public and social welfare of the State demand this provision for the education of its children, and, in order to assure attendance, provides for it free of charge.

It may be claimed, as an axiom, that a State which thus assembles its children from day to day in public buildings which it provides, should see to it that these are divested of all avoidable unwholesome circumstances. In other words, the children in this enforced assemblage, for the State's good and for the good of its children, should not be subject to any preventible cause of disease. This means a great deal, both for the child's future and the future of the State. We cannot here discuss it in detail, but only seek to summarize what it does

mean, and what it is the duty of the State, of trustees, of teachers, of local authorities and of parents to seek to secure.

Adaptation.—It is ever to be remembered that the question of healthfulness is relative in all its parts. It is first a question of the adaptation of location and construction for the purposes designed. It is next a question of how the building is to be used in carrying out the design. Many a building well designed is only partially utilized for health, because the teacher does not understand the methods of adaptation. An overcrowded room may, in a half hour, disturb the equilibrium of a system of ventilation perfectly adapted to the school for which it was designed.

Management or the executive administration is often the essential in which there is failure. The most perfect mechanism does not run itself. Nor is it run by the good intention of the overseer. It is only knowledge of how to manage it, and faithful quickness of perception to manage it aright, that secure the satisfactory results. Therefore, nothing can take the place of knowledge and attention on the part of teachers, janitors and other officers. But as these should not be embarrassed in their efforts by structural defects, we notice:

I. BUILDINGS, THEIR LOCATION, CONSTRUCTION, ETC.

Location should have reference to the kind of ground, as to whether it is sterile or full of organic matter; the latter, while good for plants, is not needed for school children.

Next, is it sandy, gravelly, clayey or rocky? Is it wet, swampy or dry? Well drained or ill drained?

In this respect school-houses are best located on dry ground, or such as has been made so by thorough drainage. If the ground is such that a cellar would be likely to be damp, the building is better to be placed on a foundation raised from the level sufficiently to admit of free circulation of air beneath. The contour of the ground should be made slightly to decline in all directions from the building. Water from the building should not be allowed to run off and soak in the ground adjacent thereto.

The school-house should not be closely surrounded by trees or by buildings on the sides where there are windows, because light and not shadow is needed. Excessive sunshine within the building must be guarded by outer or inner blinds. As a rule, the sunlight is best distributed when the corners conform to the four cardinal points.

Construction.—The material for construction is the same as that adapted for the best houses. But, as for two days in a week, or at vacations, the building is not occupied, and only for part of the day at other times, heating and ventilation are less regular, and dampness is more apt to occur than in well-managed private dwellings. If brick or stone is used, the damp-proof layers are often important, as well as wainscoting and a little deeper furring than usual.

Thirty-eight by twenty-three feet is about the model shape of rooms, according to the best authorities, with not less than twelve feet of ceiling. These dimensions are determined by laws as to light, sound and capacity. This size would be adapted to about forty scholars at most.

Windows need to be set with reference to the size and shape of school rooms, and, if wrong, should be altered in buildings already erected.

Windows should reach nearly to the ceiling, and may come within about three and a half or four feet of the floor. It is best to have the light diffuse itself from above the level of the pupils. The upper part of the windows and the ceiling serve to send down the light. Porticoes or projecting roofs or window-ornaments should not be placed on the outside so as in the least to obstruct the light.

Inside blinds or shutters are convenient, as these may be adjusted to keep out the rays of the sun or to regulate the light. Ceilings should be white, as they thus help to reflect the light. The walls are best of gray or some neutral tint.

Light should not enter directly in front of where the pupil sits. As the right hand and side are used most in writing, drawings, etc., for many purposes light from the left side is better. The Germans so insist upon this as to build school rooms with windows on the left side only. Light can also be let in from above. Blackboards or slates between windows receive the light unfavorably. Eyes and eyesight are often imperceptibly injured in our school rooms.

Doors should be wide and open outward. As they often connect with entry-ways, and when wide open cause draughts, they are not so safe for ventilation as windows. A transom window over the door is better for ventilation. They should generally be self-closing.

Stairs should be of easy rise and with platforms rather than spiral. School-houses should seldom be over two stories in height. Frequent stair climbing is, for many, not good exercise, and those in the upper rooms, in order to avoid it, often remain in at recess.

Entries should be roomy. Often there is need of an extra hall and

stairs or other fire escapes, since, in alarm or panic, children cannot be expected to have deliberate forethought.

Hard finish is generally the best for walls. They should be very smooth, as dust clings to rough surfaces. Paper is too absorbent for school walls.

Rooms in which outer garments or wet clothing, baskets, etc., are kept, should have ventilation, and pegs or shelve-pockets should be so arranged as not to crowd any soiled or wet clothing.

A small wash room, with hand basin, is needed in most school-houses, and would greatly promote cleanliness. The Chinese towel, or other towel paper, obviates the necessity of a towel in common.

School Desks.—These should be arranged with reference to the places where light or heat enters, and to the positions of teachers. They should not be against walls. Children with defects of hearing or seeing should be located with special reference thereto. Each pupil should be able to touch the floor or a foot-shelf easily with the feet. The seat should have its edge on a line with the lower edge of the desk. This preserves the best posture. When the child is sitting erect, and the elbows hanging freely by the sides of the body, the part of the desk next to him should be two inches above the line of his elbows.

The slope of desks should be at an angle of about 10°, or slightly varying from it. It is better if this admit of slight variation, according to the preference of the pupil or the directions of the teacher. The usual arrangements of desks, by which the seat is attached, is somewhat constrained, and does not admit of that change of posture and successive rest of muscle which is desirable. Until there is some change in this respect, so as to admit of more comfortable seats, the chief dependence must be on that change of posture which comes from recess, from recitations or from a five minutes exercise in calisthenics at the close of each hour. Desk seats that fold up are to be preferred. The number of desks in a room should depend on the number of pupils, as even the smaller ones should not be left all the time without this aid.

PURITY OF AIR, ETC.

The capacity of a school room as to numbers, after some general indications arising from laws of light, sound, floor space and height of ceiling, is to be determined by our ability to furnish air of proper

purity, temperature and moisture for the length of time required. These, it is true, vary in some degree by varying circumstances. The purity of air is not only affected by numbers, but by the condition of the persons. It is not merely the amount of carbonic acid that may be given off from the breath. Unhealthy or dirty children contaminate the air more rapidly than those that are cleanly. A school in a tenement-house population needs greater exactness of provision and administration. Children ill clad or sickly are more susceptible than those of average health on certain days. When the atmosphere is very dry or saturated with moisture the usual laws of capacity are disturbed. Yet there is a law which is quite generally correct. The air is said to be pure when it approximates nearly to the standard of the outside surrounding air. It is regarded as sufficiently pure when the impure air being produced is being uniformly diluted by fresh air "to a certain standard of relative purity." It is found that the amount of carbonic acid in the air is one of the tests of its relative purity. Thus pure air contains 4–10,000 of carbonic acid gas. If human breath is added to it, up to 7–10,000 or 8–10,000 or more, it is sensibly close to most persons. If beyond what this indicates, the persons are giving off more than a usual amount of effete organic matter from the breath, skin, etc., the air becomes still more rapidly deteriorated.

Of all the impurities of air, that which stands highest in the scale of injury to health is organic matter. The amount of carbonic acid present is an approximate test of this. Careful examinations have established the rule that when air contains over six ten-thousandth parts of carbonic acid, it is too impure for continuous healthy breathing.

The problem is this: What is the greatest number of persons that can be, for a given time, in one and the same room, and for whom there can be introduced an amount of pure air sufficient to preserve the standard, without causing a *draught* such as might give rise to colds or discomfort?

Careful practical experiment and allowances for insensible sources of air "show that arrangements which appear to provide for a volume of air much less in amount than that obtained by calculation, will keep the room in a fair condition. These results have pointed to about 1200 cubic feet of air to be admitted per hour for each person in rooms occupied by persons in health." This gives an average admission of 20 cubic feet per minute for each person. This, in a room for fifty scholars, would be 1000 feet per minute, even without

any allowance for stoves or other sources of contaminated air or incidental variations that may occur. To supply this requisite amount in a room 25x32, with ceilings 12½ feet high, the entire air of the room must be changed *six times* each hour. We cannot, by ordinary means, move the entire air in a room oftener than three times per hour without draught. (See our 1st Report.)

The velocity of the air as it flows in and out of a room, as measured at the openings for admission or exit, should not exceed one foot or, at most, two feet per second; firstly, in order to prevent a sensible draught being felt, and, secondly, because low velocity is favorable to the uniform diffusion of the incoming air through the room.

Air should be introduced and removed at such parts of the room as not to cause sensible draught. Air flowing against the body at or even somewhat above the temperature of the air of a room will cause an inconvenient draught, from the fact that as it removes the moisture of the body, it causes evaporation or the sensation of cold. Air should not, as a rule, be introduced near the floor level. The openings would be liable to be fouled with sweepings and dirt. The air, unless very much above the temperature of the air of the room, would produce a sensation of cold to the feet. The orifices at which air is admitted should be above the level of the heads of persons occupying the room. The current of inflowing air should be directed toward the ceiling and should be as much subdivided as possible by means of numerous orifices.

When the outside air is of the right temperature, or a nearer approach thereto than we can secure by any indoor arrangements, it is wise to trust to openings between the room and the outside air for our supply. Hence, it becomes a study what these openings shall be and how they shall be regulated. Windows are among the most valuable. It is a great practical art of the teacher to know how to regulate their use. Air may often be admitted near the ceiling or between the two sashes, or be directed upward by a hood or cowl and so diffused in the room, when its direct admission would cause draught or be too cool. A strip of board under the lower sash serves to keep out direct draught and opens a space between the upper and lower sash, and so is a simple device often applicable. A wire screen, fitted in windows, admits air while diminishing draught. Openings in the side walls, such as the Sherringham's ventilator, introduce outer air and incline it upward, or such as Tobin's, receive it near the ground and inlet it above the head level.

Much can be done for the natural ventilation of school rooms by their management when unoccupied. They should be thoroughly flushed with air before and after school. This does not mean the opening of a single window, but such general opening of all outlets to out-of-doors as will allow an entire flushing of the room. At recess the same can be partially or completely done. Sometimes the opening, on account of temperature, may have to be momentary. It may often be made just after the room is vacated. Windows may be lowered during gymnastic or calisthentic exercises, even when the air would be felt too cool for a sitting posture.

ARTIFICIAL VENTILATION.

There are so many forms of artificial ventilation that it is very necessary that, where these are relied upon, teachers make themselves fully acquainted with their mode of action and so come to have judgment in their regulation. They do not take the full place of natural ventilation by windows, etc., but are of chief advantage when these cannot be used.

Artificial ventilation consists in certain forms of apparatus for bringing pure air in and getting impure air out. The chief necessity for any such arrangements arises from the fact that the prevalent temperature of the outer or pure air needing to be brought in is not comfortable, and that the impure air within has not the chances for escape or diffusion it would have outside.

Rooms, at some seasons of the year, are almost entirely ventilated by *flues*. Of these, the chimney flue and the open fireplace are the most ancient and still often very valuable. "Few people," says Dr. D. F. Lincoln, "are aware how small a quantity of air is actually drawn out of apartments by ordinary flues for ventilation. By 'ordinary,' I mean the old-fashioned sort, of the size of one or two bricks, 4x8 inches or something about that, with a close grating, called a register, to obstruct the current at the bottom, a sharp angle at the foot, the inside roughened by protruding mortar and with only an accidental opportunity of getting warmed by contact with a smoke-stack. You stand in front of it with a light pocket-handkerchief; the cloth is gently drawn toward the opening; it deviates a couple of inches; you say 'it draws' and are satisfied. 'The thing is working.' Probably, in such a case, the rate at which the current moves is something like a foot per second. The flue is drawing out a

quarter or a half of a cubic foot of air per second—enough, perhaps, for *one person's* requirements."

The one question as to a *flue* is, does it draw, or do the combined flues of a room draw sufficiently or unitedly and alternately to remove the foul air? Their drawing depends upon (a) position, (b) upon direction, (c) upon smothness internally, (d) upon relative warmth, (e) upon free exit to the outer air. As heat is the motive power, if the flue is so located as to be very cold, or if, while heated at its lower part, it is very cold at its upper part or exit, the draught will be much diminished. Different states of the air make great differences in the actual draught, and a flue that does not draw is worthless. The flue needs to be warm all along its course. Its position, its connection with a chimney in which there is a constant fire, or a gas or other light or coils somewhere near or in the tube of flue can accomplish this. Flues in outside walls generally lose heat too rapidly. Stovepipes entering chimneys near a ceiling not only heat the flue and help to cause upward draught, but, if left with slight openings around the pipe as it enters the chimney, aid in ventilation.

If the shaft or flue opens into the upper part of a school room, the air drawn out is several degrees hotter than if it opens near the floor. The draught is, therefore, more powerful. Still, it is best to carry the shaft nearly to the floor, where its effect is to stimulate the circulation of the warmed air in a downward direction and to increase the heating power of the stove. No draught will usually be felt from it by a person sitting at the distance of four or five feet. We need not be influenced by any theoretical considerations as to the level where carbonic acid is most abundant—there is no great and constant difference between different levels; but we shall not fail to find sources of impurity of air more frequent at or near the floor than higher up.

HEATING, ETC.

Both because of the need of heat and of the relation of heating to ventilation, we need closely to consider the modes of heating school rooms. Every school room should have a thermometer, and the teacher's record should tell the temperature at 9 A. M., at 12 and at 2 o'clock each day, so that the trustees may have a report of the actual changes. The practical idea, which forms our model, is somehow to get into the room air of right temperature and moisture from the outside, or to bring it to a right temperature before is is introduced into the room or is breathed by the children. If, for instance, you could

have a stove with flues all around it connected at the bottom with the outer air, so that the cold air could flow up through them to the top of the stove, and from thence be diffused through openings into the room, if all other sources of air-supply could be removed, you would thus have a constant inflow of warm, pure air for breathing purposes. Or, if such air is allowed to flow over heated coils, either of dry air or steam, it can be warmed in this way. Or if, in any way, the walls and floors of the building can be kept warm so that pure air flowing in or through them or brought in contact with them is warmed, the same object is accomplished. Most of these constructions must be left to the architect or engineer, but the mere mention shows what the intent involves. Even where construction is perfect, regulation is important. As an engine, in its running, depends on the engineer, so does most heating apparatus depend much on the skill of the operator. Both teacher and janitor need to understand this fact. The warmth needs to be such as to secure an average heat of about 70°. This suits the greatest number of children in our climate. But it is to be remembered that children are more susceptible to colds than adults, and that they vary much in their impressibility. Continued chilliness is never healthy, and hence chilly persons should have better access to heat, or by more frequent exercise or more clothing should be fortified against cold.

If heat is derived from registers through the floor, there are two disadvantages. There is apt to be foul air from the space or room beneath, and those sitting near the register receive more heat than they need. Where registers have to be used for school rooms, they should not open near desks and should be so numerous as to distribute the heat at different portions of the room near to the walls.

Where stoves need to be used, they should be such as are well started before assemblage, and as will not need to be filled up during school hours.

In order to equalize the heat, and in order to secure pure air from without, it is best to provide stoves with a jacket or metal screen. A sheet-iron screen or cylinder, about four to five inches outside the stove, is placed around it and "the edge fastened to the floor." A pipe of about six inches is then carried through the floor, under the stove, and led through the house-wall. This pipe should have a wire screen at its entrance. Through this outside air is drawn in to be heated by the fire in the stove and to be diffused through the room at points far enough above the entrance for it to have become enough *heated.*

The jacket may extend all around the stove, access to it for supplying fuel or removing ashes being arranged for by a movable part, or it may be tightly fastened around the stove just above the cylinder, and lead up the warm air by pipes or opening for distribution.

Grates and fireplaces have been constructed on the same principle, so as to admit fresh air on the back or sides for warming and then causing it to be directed into the room. The whole idea in either case is that the air to be warmed for breathing should not be air already reduced in purity by use in the room. Pure air should thus have a mode of ingress.

The air in the room which has been contaminated is thus replaced by good, pure air, and, at the same time, draught made, and its removal through windows, flues or other artificial ways facilitated. Flues are better not to begin too near the floor and near the ceiling and near the sides of buildings, because an outflow near the floor aids the circulation of the air through the room as well as removes its portion of foul air, while the hotter air already breathed and so having some organic matter, is carried upward near the ceiling and needs to be removed. As organic matter tends to cling to surfaces, and as air, like water, tends to flow along surfaces, these withdrawing openings for exit need to be at the sides or near surfaces.

Air as related to moisture is important, but so far as artificial heat is concerned, we need only to say here that open basins of water, and the steam and evaporation therefrom, help to make the air more agreeable for breathing purposes. It is certain, says Briggs, from all experience, that from five to ten per cent. of moisture can be added to air after it is heated, certainly with much relief, especially to the eyes, with apparently little harm, although such addition may make the occupant of a heated room a little delicate as to out-door exposure. Moisture may, to some small extent, be abstracted by the means of heating, especially when the heating is by stoves or hot-air furnaces; at all events the presence of a sheet or surface of water over which the heated air is allowed to pass, is now a recognized means of supplying a small quantity of aqueous vapor to air of ventilation. But the quantity supplied in this way is very small in comparision with what is needed for complete "hydration," or even for what can be denominated "hydration" at all, in the sense of a summer condition. From an estimate based on several winters' experience, a vaporization of water which supplied a half grain of vapor per cubic foot of air introduced, when an increment of four to six grains for the same volume of

air would be requisite to get the summer condition of humidity corresponding to the internal temperature, has proved sufficient to give a sensibly pleasant air, while the absence of this supply was at once perceptible in the house.

Whatever may be the facilities afforded by construction, it is to be remembered that administration is a study by itself, with which the teacher needs to be acquainted. The care of the room, like that of a good housewife, must be personal. The janitor is but the assistant. Although in large buildings all work must devolve upon him, the oversight must belong to the teacher. He may also need the emphasis and aid of the trustees. Most thorough cleanliness and the proper aids for securing it must be provided. This is not only a necessity for health but a part of true education.

PERSONAL CARE OF THE CHILD.

Besides the right which every child has to find a suitable room, with proper regulation thereof, it is the right of the teacher, the trustees, and of every other child, that no child should be an avoidable cause of discomfort or disease. Because of this, all that relates to the personal cleanliness and habits comes under jurisdiction of the teacher. Uncleanliness of body or of dress are always grounds of complaint. It is not difficult for a teacher to establish a standard as to these ; to make clear the distinction between plain clothing and soiled clothing, and to make it popular with the children to be cleanly. The first step toward it is a thoroughly cleanly teacher. Every school should have rules, which should be read every month to the pupils, among which should be one that when any contagious disease is known to exist in a family, no scholar shall attend therefrom, except by a certificate from the city or township physician or attending physician. Cases may sometimes be so separated as that other members of the family have not had and will not have exposure, but a special certificate should affirm this. A board of trustees may need sanction by a general law to say what time after sickness shall elapse before children are returned to school. Where a teacher finds a child unwell, or has reason to suspect exposure to contagion, he should, at his discretion, send the child home and report the fact to a trustee, the city or township physician, or to the family physician. The registry should show if any have not been vaccinated, and the trustees should not permit the attendance of non-vaccinated children.

If children bring food with them it should be eaten at an appointed time, under such conditions and directions as will secure comfort and deliberation. Habits of rapid eating are often learned at school. Study and play, and relief by alternations of kinds of study and play, should be provided for. While the teacher has to deal with the school or with a community subject to general laws, he also needs to recognize the individual far more than is usual in any other class, and to adopt laws and modifications to those who differ in physical or mental or moral capacity.

CIRCULAR XXIX.

Circular as to Charitable and Penal Institutions.

A law recently passed has directed the State Board of Health to an inquiry into the sanitary condition of charitable and penal institutions of this State. The need of such inquiry has been made fully apparent in the experience of other States and countries. All such institutions have to deal with classes whose cleanliness and sanitary welfare are only secured by the most thorough administration, and by careful attention to the details of a personal and intelligent oversight. The duties of the superintendents, if well performed, are far more arduous and responsible than is generally appreciated. Successful care depends upon proper buildings and grounds; proper structural arrangements as to water-supply, sewerage, heating and ventilation; upon a proper supply of food, raiment and work; upon special provisions for those who are sick or feeble, and such personal attention by officers and assistants as unites capability and faithfulness.

In prisons and jails, most of the inmates are to return to society. The greatest care is needed that during detention there should be no habits acquired nor influences exerted which will tend to make the person worse than before. A hopefulness of promoting reform should be entertained and provided for.

In alms-houses, there should be a constant effort to limit those habits which cause pauperism, and to prevent its continuance either by custom or inheritance. Statistics prove that by wise planning the State has great capacity for limiting dependency, and that physical care enters largely into consideration when we would better the condition of such

classes. Every State has a wide duty in provision for this portion of its population, and in seeking to limit the pauperism, sickness or crime of those who have become its wards. Were it only a consideration of economy, it is to be remembered that these classes levy the heaviest tax that is paid for State, city, county and township expenses.

Asylums are so multiplying in our counties, in addition to our two State asylums, that all of them need the most careful supervision, since success of care and treatment so largely depends upon hygienic conditions.

It is easy for stewards for the poor or for the managers of institutions, to fall into routine methods, or, by want of vigilance, to allow various evils. Others have no appreciation of what proper sanitary care requires, and so approve their own plans, simply because they do not know of others which are far better. This Board, with its other duties, can only offer co-operation with local authorities in all that relates to the hygienic welfare of these classes. By comparing one with another, we shall find some that serve as models, while others will come to realize their defects. Already we have been able to suggest and aid in alterations and reforms which have met with ready response from local officers. The fourth Report of this Board can be had by addressing by postal, State Health Board Trenton, N. J. It contains—pages 89–112, pages 260–265, and pages 305–310—important suggestions for all public institutions. Local Boards of Health, as well as the immediate officers of institutions, are to remember that the sanitary condition of public buildings located in their districts is subject to their inquiry, if there is ground to suppose negligence.

Some of the most serious defects, as thus far noticed, are—

I. *As to Buildings.* (*a.*) Too little air space for living and sleeping apartments, especially in winter.

(*b.*) Too little care as to cellars and as to dampness around the dwelling.

(*c.*) An alms-house smell, only to be corrected by frequent house-cleaning and whitewashing.

(*d.*) Want of arrangements for the proper disposal of all excretions and refuse.

(*e.*) Absence of good ventilation, which, even if dependent on windows, would be much freer of draught if the windows extended near the ceiling, and if air was let in when needed by raising the lower sash and placing a strip of board all along under it, so as to make the place for the air to come in between the two sashes.

(*f.*) Stoves which bake the air and over-heat a small space about them, but do not furnish an even temperature for rooms.

(*g.*) Absence of sufficient stairs or arrangements for escape in case of fire.

II. *As to Persons.* (*h.*) Absence of accommodations for the first reception of inmates. No person should, as a rule, be received to any public institution without first having a general bath, a cropping or cleaning of the hair, and proper examination and change of clothing. As a precaution against contagious diseases, the person should be kept two weeks apart from the inmates. Vaccination is often required. Neglect of such precautions has recently cost a county in this State over five thousand dollars.

(*i.*) Absence of arrangements or of a system of thorough washing. All charities should have provisions and administration by which at least a weekly bathing is secured, unless some very special conditions of ill health forbid.

(*j.*) Absence of accommodation for special cases of sickness. A small building, separate from the rest, should always be at command for cases of malignant or eruptive fevers or other special cases that may occur.

III. *As to Managers, Committees, etc.* (*k.*) There should be monthly or quarterly inspections by directors, overseers or township committees, which should fully certify as to sanitary conditions. This not only prevents investigating committees, but prevents oversights, and is an aid to stewards and superintendents in their work. Generally, it is best to have a schedule of questions as a guide and to fill out accurate answers. As far as proper, inmates should be personally seen.

(*l.*) It is very desirable that a book be kept by every institution that will show the time of entrance of inmates, their previous history, their ages, social condition, the causes of sickness and death, and other items such as are now always registered in well-ordered institutions. That is a narrow view of a public charity which makes it a mere receptacle or retreat. Such records come directly within the line of that care of population which these are meant to subserve. One record or one year may not show much, but series of records through series of years point to methods of prevention or limitation too important to be overlooked.

(*m.*) We send with this circular a blank form of institutional inquiry, with the request that it be accurately filled out, so far as the superintendents, overseers or physicians of any State, city, county or

township institution can fill the same, and be returned within one month, by mail, to State Board of Health, Trenton. Add whatever may need to be said as to any special defects.

We are glad to furnish any information in our power, as to proper sanitary arrangements and care. So far as other duties will permit, we will, when desired, co-operate with local authorities in correcting defects or meeting special emergencies which may arise.

N. B.—The city clerk, assessor or Board of Health to which this circular is sent will please see that it promptly reaches the county or township or city alms-house or other charity for which it is intended and ask its return to us in due time.

By order of the Board.

Trenton, N. J., June 1st, 1882.

EZRA M. HUNT,
Secretary.

CIRCULAR XXX.

The observations of sanitarians in other countries and in a few of our States have led to the belief that the occurrence and the fatality f many diseases depend much upon geological structure, soil, topography, elevation and exposure, rain-fall, relations to seas or other bodies of water, density of population, and other local conditions not determined by the latitude or longitude of the locality. Thus, districts, or even small precincts, have their climate, which bears relations to the vitality of the people and governs the causes and courses of disease. It is for this reason that sanitary survey and topography have attracted the attention of the national government, and may well concern a State which presents diversities already so recognized by common observation as to have led to preferences and selections of resorts in adaptation to different kinds and phases of diseases. While these general observations are valuable, it is only by the close and confirmatory observations of experts and the tabulation of closely-noted facts that we arrive at well-sustained conclusions. It is fortunate for this State that its geology and topography are so well mapped as to afford an excellent basis for this kind of observation. After a conference with Prof. George H. Cook, the State Geologist, this Board found it feasible to supply at original cost a sufficient number of maps to a sufficient number of observers to make this kind

of observation practicable. It is proposed, in connection with medical societies and other scientific societies or individual observers in the State, to place this map in the hands of some chosen observer, who, up to the year 1885, will collect from the township or city in which he resides such data as shall enable him to estimate the relation of his particular locality to disease. The areas chosen will be townships and cities, and, of the larger cities, wards, or some more natural divisions, with a map of reference pointing out the relations of each locality, with the facts from time to time furnished by our reports and vital and meteorological data, we shall hope to give fixedness of attention and uniformity of system to the observations. Much will depend upon the choice of an observer who is painstaking, and who has some skill in accurate methods of observation.

He would first study with care the locality with which he has to deal in all its tellurial conditions. He would inquire how it varies as to degrees and moisture, how far the wells and river-beds indicate its usual and varying water-level, how the relations of valley, hills and bodies of water affect the degree of heat it receives and how prevailing winds indicate its local changes or result from its adjacent relations.

He would seek from the assessor or city clerk the deaths in the district, with age, date and place of residence in order to see whether for these years the relations of these to the general or precise locality could be discovered, and note explanatory views. To some degree, as in rheumatism or consumption, he would seek to know how far locality produced or influenced the progress of the malady. If a part of his township or ward had marked diversity from that in which he lived or over which he rode, he would select some careful observer to afford such information as appertained to his valley or hill or water front. Often a few questions at the meetings of medical men would aid to give precision in place of the casual impressions too apt to be accepted from a very few cases. The laws of locality thus become informatory as to disease. If, for instance, every house in a township could give the history of every case of disease that has occurred in it the last fifty years, and one skilled in etiology and classification could handle the data, he would come to know what significance to give to cases and learn from them to unriddle causes far better if he can be a living witness and investigator, and so have sources for comparing and correcting observations. Thus, not only the records of death, but of disease and the personal experience of local practitioners is secured

A map can be had by each president or reporter of a county or city society, as the property of the society, in order that views may be compared. A physician, who has lived and practiced many years in one locality and whose note-books can remind him with exactness of cases and circumstances, has really very much information as to climatic or other local causes which he can give and which ought not to die with him.

Short notes, made at the end of each month as to its characteristics and diseases and summed up the end of each year, would aid much in the final summary. So soon as a full list of observers is secured, a very brief yearly report will be asked, so as to assure a full return at the end of the period. For the small expense incurred in correspondence, it is hoped provision will be made. As localities and the methods of individual observers are so diverse, no precise form will be given unless asked for. The design is rather to get the mature judgment of the observer, formed in his own way, except that it should depend upon the careful study and analysis of closely-noted facts and be formed on expert and continued investigations and reflections. It should be the observation of precise methods rather than the promiscuous methods of unskilled observers. We hope by the time of the semi-decennial census to be able to get a sufficient number of data to give valuable guidance. The effort is to get in connection with vital returns, the personal testimony of some competent observer. That experience is most valuable, which, either by statistical or other methods, classifies knowledge, and so has breadth of view and system of analysis in making conclusions.

When the physicians of any locality come to study accurately the deaths of each year, the diseases of each year, to compare vital statistics with their own observations, when they acquire the habit of being observers on a system to such a degree that their conclusions are arrived at not as hasty generalizations or from a few recent cases, but as the record of an analyzed experience, we always secure most valuable facts as to public health and the prevention of disease. Carefully collected statistics and carefully collated experience are the two factors of information upon which the State care of the health of the population must rely. We therefore ask societies and individuals to aid in this work, and all the more, because it is not less vital to the progress and success of medical science and art than it is to social and sanitary progress. Any physician, who thus on a system files away his observations each three or six months, will have no difficulty at

the close of each year, or at longer periods, in furnishing valuable data as to the diseases of his locality and suspected impairments to the general health.

By order of the Board.

Trenton, Feb. 15th, 1882.

EZRA M. HUNT, M. D.,
Secretary.

SLIPS SENT HEREWITH.

TRENTON, April, 1882.

To the County Medical Reporter:

DEAR SIR:—Inclosed please find circulars, and one of each please mail, with a postal inclosed, in a circular envelope, to such person in each city or part thereof, and in each township of your county, as you may choose, to aid in this work. Write your own name in one corner on the outside of the envelope. On hearing from them, I will send map and inform you.

Respectfully,
E. M. HUNT,
Secretary.

To Local Health Reporter:

DEAR SIR:—In accordance with the circular herewith inclosed, we have appointed a physician of your county to have oversight of the work proposed. It is his and our desire to have you act as a reporter to, or occasional correspondent with him in furthering the objects of this inquiry. If you will favor us by so doing, a map will be sent you and arrangements be made for the small expense of correspondence. Be pleased to reply by postal to State Board of Health, Trenton, at your earliest convenience. If for any reason you cannot serve, please give the name and address of the physician whom you would recommend.

E. M. HUNT,
Secretary.

CIRCULAR XXXI.

Circular as to Petroleum, Kerosene, etc.

The Legislature of New Jersey, at its last session, passed a law in reference to the use of "petroleum or coal oil for lighting and illuminating purposes," (see ch. 168, Laws of 1882.) In the Second Report

of the Board of Health (1878,) pages 16–22, and the Fourth Report, (1880,) pages 25–28, and the Fifth Report, pages 22 and 106, the need of legislation upon the subject is illustrated. These are but items in the records of destruction of human life which has occurred from a substance which is safe and valuable for lighting purposes, if properly prepared. A careful estimate has placed the number of deaths from kerosene in the United States as high as 6000 in a single year. Fire and destruction of property often result. The law which has been passed is the extreme limit of leniency, and its value depends on its rigid enforcement. We have the assurance of the co-operation of many of the manufacturers, and only need the aid of local Health Boards and retail dealers to make it fully operative.

It will be the duty of all local Boards of Health to see to it that the people in their respective districts are protected in the manner and to the degree which the law provides. Besides the notice given by the State Board of Health and in the newspapers, it will be wise for local Boards to send copies of this circular, which can be had on application by postal to us, to all venders of or dealers in illuminating oil in their respective districts.

Section first of the act holds all dealers responsible that the oil which they are selling for household illuminating purposes, shall be proper for use as certified by the test and method of testing herewith adopted. Any person who can prove that he has bought oil of a less grade "for inside light" may bring suit. Sections fourth and fifth give, in addition, the power to those named therein to enter and procure the oil for the special purpose of test. In such cases the vender "*may* be enjoined and prohibited" by special notice, but this does not prevent action without notice by those who have purchased for actual use for lighting purposes. Purchasers of oils to be sold in this State, should have the guaranty that the oils purchased are such as will answer the test herein given, and should not, when purchasing from refiners outside the State, rely upon the brand, but ask the written guaranty of the dealer.

If imperfect oils are brought into this State, not in accord with this law, we shall do all in our power, by exposure and prohibition of sale, to expose this wrong against human life.

The following are the means of ascertaining whether or not petroleum or kerosene to be sold for lighting or illuminating purposes, is of the character required by the act; and as such, is hereby declared

by the Board of Health of this State, together with the Council of Analysts appointed by it, to be the means of determination.

"Saybolt's Electric Tester" shall be used both for determining the fire test and the flash test as indicated by section three of the act, (see ch. 168, Laws of 1882.) And the instrument shall be operated in accordance with the instructions for using the "Saybolt Tester," adopted by the New York Produce Exchange, which took effect August 1st, 1879, but with this difference: that for oil of 110° fire test and upwards the oil shall (after the first flash) be flashed at 95, 100, 104, 108, 110, 113, 115.

We give the following modified instructions for using the Saybolt Electric Tester for ascertaining the flash and fire test of petroleum and kerosene; and as adopted by the State Board of Health and the Council of Analysts of New Jersey.

DIRECTIONS FOR USING THE ELECTRIC TESTER.

Fill the metal bath with water, leaving room for displacement by the glass cup.

Heat the water until the bath thermometer indicates 100° Fahrenheit, at which point remove the lamp.

Fill the glass cup with oil to top line, indicated by the rim surrounding cup, which is one-eighth of an inch below top edge of the cup.

See that there is no oil on the outside of the cup, nor upon the upper level edge, using paper to clean cup in preference to cotton or woolen material.

See that the surface of the oil is free from air bubbles before first flash is produced.

Lift the cup steadily with left hand and place in the bath.

Suspend the thermometer with the bulb of same immersed just from view under surface of oil.

Adjust the flashing bar, with the stamped side of the bar facing the operator, immerse the battery zincs in fluid, and when so immersed during the operation they should not come in contact with the carbon plates.

Try for first flash every degree until the same is obtained.

Attain flash by producing spark with one stroke of the key.

The stroke on the key should be such as in telegraphy is used to produce what is called a dot, that is, a short quick stroke.

When the thermometer in the oil indicates 90°, introduce lamp under the bath, and do not remove it until the operation is finished.

The temperature of oil when placed in bath, should not be lower than 55° nor higher than 70° Fahrenheit.

The flashing bar must be free from oil before adjusting for tests.

Drafts of air must be excluded from the apartment wherein tests are made.

Oil of 110° and upwards, shall (after first flash) be flashed at 95, 100, 104, 108, 110, 113, 115.

Oil of 120° and upwards, after first flash, 100, 105, 110, 115, 118, 120, 122, 125.

Oil of 130° and upwards, every five degrees after first flash until burning point.

The strength of the battery should be regulated by the zincs to produce just sufficient power to obtain continuous sparks.

The vibrator at the left-hand side of the induction coil is adjusted by means of a set-screw, and should be set so that a continuous spark is the result when the battery is working. Further details can be had of the manufacturers, 62 Beaver St., New York City.

An oil which flashes at 113° *without taking fire is to be regarded, in accordance with these instructions, as having stood a burning test at least as high as* 115° *; it may have stood a higher one.* In general, the fire test of the oil is the degree whose number (in these directions) next follows the degree at which the last flash without ignition of the oil itself took place.

Thus, for oil of 120° and upwards, if the flash at 118° was not followed by ignition of the oil, while the flash at 120° set fire to the oil, the oil would be regarded as having attained a fre test of 120°.

In case of any accident occurring from the *actual explosion* of any lamp or can containing oil, the Local Board of Health should at once procure specimen and evidence as to its source and have the same tested by some competent chemist. Even where accident has resulted from the improper use of oil, as in lighting fires, the rapid explosion has resulted from gas present in the can or the intense inflammability of the oil.

All cities should employ a local inspector, who, if need be, can be duly authenticated by this Board. Besides the oversight of local Boards, we shall use proper methods for discovering the qualities of kerosene offered in the market and the sources from whence it comes.

It is to the interest of all that a safe kerosene be used. Heretofore the production of a poor article has made an unfair competition, which it is hoped to overcome, since life and health are endangered and fair dealing is prejudiced thereby. The following is that portion of the law which relates to the qualities of oils and the penalties:

"An act to regulate the sale of petroleum and its products.

"1. *Be it enacted by the Senate and General Assembly of the State of New Jersey,* That hereafter petroleum, or any of the products thereof, may only be sold for use in this State under the following regulations and restrictions, viz.: (*a*) benzole, gasoline, naptha and benzine must be sold under their true names respectively, and such names must be plainly shown upon the barrel, can or vessel in which the same are sold or offered or exposed for sale respectively, or upon a label securely fastened thereto; (*b*) petroleum or kerosene which will inflame at a less temperature than one hundred and fifteen degrees Fahrenheit, fire test, or flash at a less temperature than one hundred degrees Fahrenheit, flash test, must have plainly designated upon the barrel, can or vessel in which the same is sold or offered or exposed for sale, or on a label securely fastened thereto, the number of degrees Fahrenheit fire test below which the same will not inflame; (*c*) only such product of petroleum as will not flash at a less temperature, or flash test, than one hundred degrees Fahrenheit, or such as will not inflame at a less temperature than one hundred and fifteen degrees Fahrenheit, may be sold for lighting or illuminating purposes, except where the same is to be used in street-lamps or open-air receptacles, or in gas machines, in which case (as to petroleum or kerosene) there shall be plainly marked on the barrel, can or vessel in which the same is sold or offered or exposed for sale, or on a label securely fastened thereto, the words 'not for inside light;' provided, that this act shall not apply to petroleum or its products sold in tanks used for transportation.

"2. *And be it enacted,* That if any person shall sell or offer or expose for sale, for use within this State, except in the manner permitted by this act, any petroleum or product thereof, he shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine not exceeding five hundred dollars, or imprisonment at hard labor or otherwise for a term not exceeding one year, or both; and any sale in quantity less than one barrel shall be presumed to be for use within this State."

The law goes into effect July 1st, 1882. The notices thereof, as

required, have been given in the circular of April 20th, and the county notice of June 20th, 1882.

By order of the Board.

Trenton, June 20th, 1882.

EZRA M. HUNT,
Secretary.

CIRCULAR XXXII.

To Local Boards of Health of Cities and Townships.

The importance of a care of the public health on the part of local authorities is now generally recognized in this State. The value of a local Board consists in its readiness to meet sudden perils to the public health; to prevent nuisances or abate those which exist; in its ability to impart information, and its power to enforce laws where other methods fail. "The Circular to Local Boards of Health" and the "Suggestions to Boards of Health and References to Sanitary Laws," to be found in the Fifth Report (1881,) pages 181-188, should be carefully noticed by all Health Boards. In addition, important legislation has been added to that of previous years. We herewith send a printed slip of a law just passed as to local Boards. It extends and fully corrects all defects of power in such Boards of Health as have been organized under the laws of 1880 and 1881. (See ch. 155, Laws of 1880; ch. 135, Laws of 1881.) It applies to all townships and to all cities that had not special Health Boards under their charters previous to 1880, and by the law of 1881 may be adopted by these. Some have already adopted it, and the three or four that remain should do so without delay.

It can now be claimed that in most respects sufficient provision has been made for the efficiency of local Boards so far as they can or ought to be empowered by law. It is to be borne in mind that under common law, as well as under these special provisions, there is remedy for many nuisances hazardous to the public health. These Boards, both by virtue of their own powers and by virtue of other rights accorded for the protection of health, ought to be able, when necessary, to control or abate flagrant evils, and to do very much in preventing the causes of disease. In all cities and towns there should be regular

meetings of the Boards; and in all townships at all regular meetings of the township committee, they should recognize this as a part of their service. The work appropriate to local Boards is already outlined in the circulars of this Board, to be found on pages 184–187 and page 207 of the Fifth Report. In addition, there are circumstances which often give special importance to the consideration of prominent local evils. Each Board should realize that it has as much to do in preventing evils, and in instructing the people how to avoid nuisances, as in abating existing nuisances.

In securing a more perfect return of marriages, births and deaths it can be of essential aid to the city clerks and assessors. We must know the ages and conditions of population in order to study the significance of death rates. Besides, it is the legal right of each person to have such record made. Hereafter neglect must lead to stringent action on the part of local Boards and of the State Board.

The new milk bill which has been passed can be made of great service as a protection to the health of children and invalids.

The new law as to illuminating oils makes it a misdemeanor to sell any dangerous oil. Local Boards should be watchful over this evil, and report any infringements.

The bill as to adulteration of food is also in full force.

All cases of contagious diseases of animals need to be carefully watched, and report made to this Board if necessary. In cities more care should be exercised as to the keeping of animals and as to nuisances arising therefrom.

If, hereafter, any local Board fails to recognize the care of the public health and the prevention of insanitary conditions as a part of its duty, the fault will not be with the laws of this State. There will be no lack of earnest co-operation on the part of the State Board. We ask that the reports and circulars of the Board be carefully studied, and that in all other respects you will feel both the duty and the privilege of aiding in the securement of health and the prevention of the avoidable causes of disease.

E. M. Hunt,
Secretary.

P. S. If in any township, there is no Board of Health as required by law, the assessor will, on receipt of this, please send us postal containing name and P. O. address of the members of the township committee.

Trenton, April 1st, 1882.

CIRCULAR XXXIII.

Circular to Local Boards of Health as sent out with Annual Blanks.

All local Boards of Health need to make their annual return to the State Board of Health during the month of October.

All Boards which were constituted under the law of 1880-1881 are permanently in existence. The law of itself constitutes the township committee, the assessor and the township physician, if there be such an officer, as the Board of Health for each township; and also provides as to Boards of Health in cities.

In some cases, complaint is made that local Boards do not seem to know their precise duties under the law. The general law is to be found ch. 155 of the Laws of 1880.

On pages 272–282 of the Fourth Report of the Board (1880) is an explanatory circular as to the law and the duties of Health Boards. Pages 184–188 of the Fifth Report (1881) have further directions and references. If, in any instance, any Board has failed this year to consider the health matters of its town or township, it should at once be called together. It is satisfactory to know that most of the Boards realize the importance of this oversight of the public health. Some, however, take it for granted that no avoidable causes of disease exist, and, by their unintentional negligence, add to the sickness and deaths of their locality.

We ask each assessor or town clerk to state to us any failure on the part of the local Boards.

Blanks are furnished similar to those of last year. (See Fourth Report, 1880, page 281.)

A list of Boards which have reported is to be found on pages 119–179 of the Fourth Report (1880), and pages 123–165 of the Fifth Report (1881.)

Boards which have reported heretofore will not need to report the items in the schedule under A, B, E, F, G, I, L, M, N, O, P, Q this year, unless some special new fact exists.

Under C, we ask full statements as to the sources and conditions of water-supply; as to objections made to it; as to any asserted or proven sickness or deterioration of the general health resulting therefrom; also, what plans of remedy are used? also, if cisterns or driven wells are used and found satisfactory? also, if filters, and if

so, what kind are relied upon? Has the lowness of the streams and wells the last three months seemed to affect the quality of the water-supply?

Under D, we inquire as to any natural or artificial defects in drainage and as to any sickness attributed thereto by physicians. How has the amount of malarial fever, so called, compared with that of last year? Are there any serious interferences with natural water-courses? Has the State law as to drainage or the special one in addition as to the drainage of cities been applied to any case in your section?

Under D, as to sewerage, specify what town or parts of towns have sewers, with their size, construction, material, etc. Has the town a sanitary map, showing its underground structures, its contour, etc.? To what extent are brooks or streams made to carry sewage matter and have any evil results been felt?

Under H, report the situation of water-closets in relation to water-supply and the modes of disposal of excreta, of refuse and of slop-water. Also, cases in which inside water-closets or slop or kitchen sinks are connected with the outside privy-vault or with cesspools. Also, as to the common mode of emptying privy-vaults and cesspools.

Under J, give particulars as to diseases of animals; especially those regarded as contagious.

Under K, state whether slaughter-houses and abattoirs are situated near to private houses.

Under L, state what trades or factories cause a nuisance, and whether by smoke or refuse.

Under R, report any sanitary improvements of the past year and any in contemplation.

Under T, state any known causes of the spread of disease or any neglect of vaccination.

Under W, add a general report as to prevalent diseases from July 1st, 1881, to July 1st, 1882, and make a separate noting as to any especial sickness from July 1st, 1882, to this date.

Assessors and town clerks, in addition, should personally report, as is their duty, any neglect in returns of vital statistics, and by whom; since the records of the last three years already show how important is exact knowledge as to the marriages, births, deaths and causes of death in each division of the State. Many other matters of importance will no doubt occur to local Boards, on which report should be made.

We should be glad to have brought to our notice any alleged defects in existing laws. Except that defects of close study of the laws and of judicious enforcement or administration of law are not to be attributed to the laws themselves.

Indifferent attention to duty, dilatory dealing with undoubted nuisances or promiscuous doubts where legal advice would clearly point out the methods, are not to be taken as defects of law. It is found that the calm judgment of courts and juries is against nuisances prejudicial to the public health; that present laws are applicable to such nuisances, and that where reason and persuasion will not avail, the execution of sanitary law has as good a chance of being sustained as has any other form of necessary litigation.

Note especially the law, ch. 155, Laws of 1882, which corrects some defects in former laws.

Let town clerks and assessors see to it that all circulars sent them are read before the Board of Health or township committee, and copies fastened in the Health Book.

By order of the Board.

Trenton, October 1st, 1882.

E. M. HUNT,
Secretary.

CIRCULAR XXXIV.

As to Vital Statistics.

[See page 255.]

CIRCULAR XXXV.

General Circular as to Duties under the Laws Relating to Vital Records and Statistics.

TO CLERGYMEN, JUSTICES OF THE PEACE, ETC.

It is not only a breach of law, subjecting you to penalty, but a risk to the personal rights of individuals, to neglect the return, within thirty days, of a marriage certificate to the assessor of the township or city clerk of the city in which the event occurs. Blank forms can be had of the assessor or city clerk, or through postal addressed: Bureau of Vital Statistics, Trenton, N. J.

TO PHYSICIANS, ETC.

Returns of births are not only required by law, but essential to that right of record which is thus secured to every child. Birth rates and death rates need to be compared in order to know sanitary conditions. The returns to assessor or city clerk, must be made each month. Your promptness will greatly aid us in comparisons. Blanks can always be had of assessors or city clerks, or through postal addressed: Bureau of Vital Statistics, State House, Trenton; or a small hand-book when preferred.

N. B.—See law that physicians must have their diplomas on record in office of county clerk.

TO UNDERTAKERS.

You are aware that the *burial* of any person by you without a permit is contrary to law. A failure to find the record often obscures legal claims, and may subject you hereafter to great risks. Where the *death and burial* are in a township outside of city limits, the certificate of death answers as a permit. Delay to obtain the certificate until after death, and burial without a permit must not occur. Assessors, clerks and local Boards of Health must report any negligence to Bureau of Vital Statistics, Trenton, N. J. Keepers of cemeteries and church-yards must see certificate of death or permit.

City clerks will please note ch. 81, page 119, section 4, Laws of 1879.

TO CITY CLERKS AND ASSESSORS.

This bureau has sent notices, to secure prompt returns, to all physicians, clergymen and undertakers. Under the law, any negligence, with the name and address, must be reported to us. Ch. 155, page 207, Laws of 1880, gives full power, also, to local Boards. These returns are essential as records, and for the study of local evils, and of the means to protect the life, health and welfare of our population. The full success of some cities and townships shows that local defects in returns are not the fault of the law, but result from negligence or want of judicious oversight.

Order blanks of Bureau of Vital Statistics, Trenton, N. J., *before* you are out, so that none may complain.

CIRCULAR XXXVI.

STATE OF NEW JERSEY.

Department of State and Bureau of Vital Statistics.

The necessity of a State record of every marriage, birth and death, the legal rights of those concerned, and the penalties for neglect of returns are such that omission to obey the law may at any time cause you both difficulty and expense. We shall hereafter take it for granted that all know the law. Returns should be made in ink and care used as to dates. All city clerks and assessors can, at any time, supply blanks or any needed information, or a postal directed "Bureau of Vital Statistice, Trenton, N. J.," will bring reply.

Trenton, January, 1883.

By order of

HENRY C. KELSEY,

Secretary of State.

CIRCULAR XXXVII.

As to Exhibition of Sanitary, Household and Ornamental Articles and Appliances.

In the practical application of sanitary science, it has become necessary to use very many appliances, both for convenience and to guard against evils incident to household and city life. These inventions have become far more numerous and useful than is generally known. To afford the people a better opportunity to become acquainted with their merits, both by personal examination and by the opinion of experts, the Agricultural Society of New Jersey, the State Board of Health and various sanitarians throughout the State have united to produce an exhibition of sanitary appliances.

Although the first of the kind attempted in this country, it has been so highly successful the past three years as to have led them to make it a prominent feature at this great annual gathering of our citizens. This fair is held for a week each year, only a few miles from New York City, at Waverley, near Newark, on the direct route to Philadelphia and the South and West. Many thousands of visitors from this and other States every year examine this display, and it

affords the best opportunity for familiarizing the people with valuable improvements.

It opens this year on September 18th. A special building for the sanitary department, supplied with water, is provided, and the actual working of house systems, ventilators and various other appliances can be shown. It is intended to make this exhibit an attraction at our annual fairs, so that all may become acquainted with the best sanitary arrangements and inventions, and dealers have a good opportunity for comparing and testing apparatus. When necessary, the judges will order trial, and postpone award until satisfied. Articles of any class may be sent either as competing for premium or for exhibit. Every article should bear a descriptive label, containing detailed information respecting its construction, use, wholesale and retail price; they must also bear the name of the owner or agency exhibiting.

MUSEUM.

The State Board of Health has commenced at Trenton, the capital of the State, a museum of sanitary appliances, to which any owner or manufacturer may present the articles exhibited as the property of the State, for permanent examination and exhibit. Specimens of all new sanitary inventions are solicited and may be sent care of E. M. Hunt, M. D., Trenton, N. J.

The following is an abbreviated summary of leading articles that are classed in sanitary department of fair; various other articles will properly come in this department and be subject to award.

DEPARTMENT L.

SANITARY AND MEDICAL, HOUSEHOLD AND ORNAMENTAL.

Class 43—*Domestic and Hospital Architecture, Planning, Construction and Decorative Material.*

	PRIZE.
Planning, Construction, Ornamental and Decorative Material.	Diploma.
Wall Paper, Window Blinds, Carpets.	Medal.
Samples of Building Stone, Concrete or other Building Material.	Diploma.
Pipes, Tile, Sanitary Pottery, &c.	Medal.

Class 44—*Ventilation, Lighting and Warming.*

	PRIZE.
Warming Houses by Flues, Steam or Hot Water—best system of each.	Medal.
Steam and Gas Cooking Apparatus.	Medal.
Stoves for Heating or Cooking, so as to avoid gas and dust.	Medal.
Chimney Cowls and Caps.	Diploma.
Specimen Ventilators of all kinds.	Diploma.
Oil, Gas, Electric and other Lighting Materials and Fixtures.	Diploma.

Class 45—*Drainage, Water-Supply, Specimens of Soil, &c.*

Drainage Plans and Sanitary Maps.	Diploma.
Specimens of Soil and Organic Matter, from New Jersey Experimental Station.	Medal.
Water-Supply Apparatus, as Cisterns, Flush Tanks, Filters, Refrigerators, Sinks, &c.	Medal.

Class 46—*Bathing Apparatus and Plumbers' Supplies.*

Bath Tubs and Connections.	Diploma.
Best Water Traps and Grease Traps.	Medal.
Dry Earth Closets.	Medal.
Best Pan, Hopper and Plunger Water-Closet.	Medal.
General Assortment of Plumbers' Work and Materials.	Diploma.

Class 47—*Druggists' Supplies and Sundries, Foods, Medical and Surgical Instruments, Appliances used in Teaching.*

Pure and Adulterated Drugs, Disinfectants, Deodorizers, Mineral Waters, Yeast Powders, Dietetic, Preserved, Condensed, Babies' and Adulterated Foods.

Galvanic and Magnetic Instruments.

Appliances used in Teaching and School-room Furniture.

Obstetric Instruments.

Ophthalmic "

Dental " and Work.

Aural "

For selection of each article in class, Silver Medal, Medal or Diploma.

Class 48—*Sanitary Apparatus, Best Modes of Destroying and Preserving Animals, Improvements in Preparing Food.*

	PRIZE.
Excavating and Odorless Apparatus.	Medal.
Best Means of Removing Vermin.	Diploma.
Models for Care and Protection of all Living Creatures.	Medal.
Best Mode of Destroying Animals for Food.	Diploma.
Improvements in Mode of Cooking Food for Men and Animals.	Medal.

Other exhibits of Sanitary Appliances may have Medal or Diploma as award.

Class 49—*Apparatus for Developing Strength and Saving Life, Machinery for Saving Labor, Appliances and Apparatus for the Sick and Wounded.*

Life Saving Apparatus, Fire Escapes and Extinguishers.	Medal.
Life Boats, Preservers and Life Rescue Apparatus.	Medal.
Ambulances, Invalid Chairs, Beds, Mattresses and other conveniences for the use of the Sick and Wounded.	Medal.
Hygienic Clothing.	Diploma.
Health Lifts, Gymnasium Apparatus and Improvements in Labor-Saving Machines.	Diploma.

NOTE.—In 1884, a National Exhibit will be held in Washington, D. C.

Trenton, N. J., July 1st, 1882.

REFERENCES TO CIRCULARS OF THE STATE BOARD OF HEALTH.

Circular I., Third Report, 1879, page 158. Explanation of parts of the acts as to marriage, birth and death returns. (See also Circular XXIV.)

Circular II., Third Report, 1879, page 163. As to assessors, town clerks, etc.

Circular III., Third Report, 1879, page 167. As to vital statistics.

Circular IV., Third Report, 1879, page 168. As to town clerks and assessors.

Circular V., Third Report, 1879, page 169. As to sanitary organization of cities.

Circular VI., Third Report, 1879, page 224. As to sanitary appliances.

Circular VII., Fourth Report, 1880, page 255. As to protection to bathers.

Circular VIII., Fourth Report, 1880, page 260. As to householders, city authorities, Board of Health, etc.

Circular IX., Fourth Report, 1880, page 265. As to sanitary appliances.

Circular X., Fourth Report, 1880, page 272. Circular explanatory of recent laws.

Circular XI., Fourth Report, 1880, page 281. As to local boards and as to yearly reports with schedule annexed.

Circular XII., Fourth Report, 1880, page 282. As to law regulating the practice of medicine and surgery.

Circular XIII., (*a.*) Fourth Report, 1880, page 287. To farmers and dealers in stock.

Circular XIV., (*b.*) Fourth Report, 1880, page 291. As to contagious diseases of animals.

Circular XV., (*c.*) Fourth Report, 1880, page 293. As to contagious diseases of animals.

Circular XVI., (*a.*) Fourth Report, 1880, page 297. As to milk supply.

Circular XVII., Fourth Report, 1880, page 300. To local Boards as to vital statistics.

Circular XVIII., Fourth Report, 1880, page 301, as to small-pox (I.)

Circular XIX., Fourth Report, 1880, page 305. Schedules for institutional sanitary inquiry.

Circular XX., Fifth Report, 1881, page 178. As to small-pox (II.)

Circular XXI., Fifth Report, 1881, page 181. As to duties of local Boards under new laws.

Circular XXI., Fifth Report, 1881, page 184. Suggestions to local Boards of Health as to their duties.

Circular XXII., Fifth Report, 1881, page 188. As to exhibit of sanitary and household appliances.

Circular XXIII., Fifth Report, 1881, page 191. To local Boards as to yearly reports.

Circular XXIV., (*d.*) Fifth Report, 1881, page 193. As to contagious diseases of animals and law.

Circular XXV., (*e.*) Fifth Report, 1881, page 197. As to contagious diseases of animals.

Circular XXVI., (*f.*) Sixth Report, 1882, page 213. As to contagious diseases of animals.

Circular XXVII., Sixth Report, 1882, page 220. As to sanitary instruction and training in schools.

Circular XXVIII., Sixth Report, 1882, page 222. Sanitary school circular of the New Jersey Board of Health.

Circular XXIX., Sixth Report, 1882, page 233. As to charitable and penal institutions with accompanying slips.

Circular XXX. Sixth Report, 1882, page 236. As to sanitary survey, topography, etc.

Circular XXXI., Sixth Report, 1882, page 239. As to petroleum, kerosene, etc.

Circular XXXII., Sixth Report, 1882, page 244. To local Boards of Health of cities and townships.

Circular XXXIII., Sixth Report, 1882, page 246. To local Boards of Health.

Circular XXXIV. (Just re-printed and ready on call by postal and in next report.) As to vital statistics. To assessors, Boards of Health, clergymen, coroners, physicians, midwives, undertakers, etc.

N. B.—*This Circular may be referred to* on page 158, etc., of Third Report, 1879, where are also other circulars relating to vital returns. This and the two following circulars can be had for postal by all assessors, city clerks, or any whose duty it is under the law to make returns.

Circular XXXV. Sixth Report, 1882, page 248. As to vital records.

Circular XXXVI. Sixth Report, 1882, page 250. As to vital records.

Circular XXXVII. Sixth Report, 1882, page 250. As to exhibit of sanitary appliances.

REFERENCES TO LAWS RELATING TO THE INTERESTS OF PUBLIC HEALTH.

On page 143 of First Report, 1877, will be found a list of references to former laws bearing on public health.

As the scope and duties of the Board have since been extended

there should be added to this list as found in the *Revision of the Statutes of New Jersey*, 1709–1877, as follows:

I. "An act relating to the transportation of explosive and dangerous material." Approved March 17th, 1874. Page 263.

II. "An act to prevent the willful pollution of the waters of any of the creeks, ponds, or brooks of this State." Approved April 21st, 1876. Page 1297.

III. "An act to prevent the deposit of mud, earth, soil, ashes or refuse on the New Jersey shore of the Hudson river." Approved March 9th, 1877. Page 1297.

IV. "An act for the incorporation of societies for the prevention of cruelty to children." Approved April 15th, 1876. Page 1344.

V. "A further supplement to an act entitled an act to provide for the drainage of lands." Approved March 8th, 1872. Approved March 8th, 1877. Page 1352.

VI. "An act for the construction, maintainance and operation of water-works for the purpose of supplying cities, towns and villages of this State with water." Approved April 21st, 1876. Page 1365. (See also Chapter CLXXXII., Laws of 1880.)

VII. Supplement. Approved March 7th, 1877. Page 1368.

VIII. "An act to prevent the spread of glanders among horses." Approved March 31st, 1864. Page 24.

IX. "Protection against mad dogs." Approved March 28th, 1862. Page 25.

Additional Laws to be Found in the "Laws of New Jersey" since the Revised Statutes, 1709–1877.

1878.

I. "An act to provide for sewerage and drainage by incorporated camp meeting associations or seaside resorts." Chapter XL., page 65. (See, also, Chapter CLVII., Laws of 1880, etc.)

II. "An act to provide for the assessment and payment of the cost and expenses incurred in constructing sewers and making other improvements in townships and villages." Chapter LIX., page 70.

III. "An act relating to municipal or other authorities owning or managing works for the supplying of water to the public." Chapter LXX., page 92.

IV. "An act to prevent the pollution of the waters of any of the creeks, ponds or brooks of this State." Chapter CXL., page 211.

VIII. "An act for the formation of borough governments in seaside resorts." Chapter CLVI., page 232. (See page 237.)

IX. "An act for the protection of dairymen and to prevent deception in sales of butter." Chapter CCIII., page 317.

X. "An act concerning the registry and returns of marriages, births and deaths." Chapter CCXXXIX., page 355, (amended.)

XI. "An act for the formation of borough governments." Chapter CCLX., page 403.

LAWS OF 1879.

I. A supplement to an act entitled "An act concerning the registry and returns of marriages, births and deaths." Approved April 5th, 1878. Chapter LXXI., page 117.

II. A supplement to an act entitled "An act to enable cities to supply the inhabitants thereof with pure and wholesome water." Approved April 21st, 1876. Chapter LXXXVI., page 168.

III. "An act for the improvement of the sanitary condition of cities." Chapter CLXXI., page 276. (Applies only to Hudson county.)

IV. A supplement to an act entitled "An act to provide for the assessment and payment of the costs and expenses incurred in constructing sewers and making other improvements in townships and villages." Approved March 12th, 1878. Chapter CLXXV., page 287.

LAWS OF 1880.

I. A supplement to an act entitled "An act to prevent the willful pollution of the waters of any of the creeks, ponds or brooks of the State." Chapter LII., page 61.

II. "An act respecting sewerage and drainage." Chapter LVI., page 69.

III. An act entitled "An act concerning the protection of the public health and the record of vital facts and statistics relating thereto." Chapter CLV., page 206.

IV. "An act for incorporation of companies for draining and improving meadows and lands overflowed by tide-water." Chapter CLXIII., page 240.

V. "An act to render more effective the ordinances of county Boards of Health and vital statistics in the several counties of this

State and to define their powers and duties." Chapter CLXXXVII., page 279. (Applies only to Hudson county.)

VI. "An act to regulate the practice of medicine and surgery." Chapter CXCIX., page 296. (See also Chapter XLIX., page 52, Laws of 1881.)

VII. A supplement to an act entitled "An act to establish a State Board of Health." Approved March 9th, 1877. Chapter CCXX., page 322. (Refers to animals.)

LAWS OF 1881.

I. "An act to authorize municipal corporations to contract for a supply of water for public uses." Chapter CIV., page 118, Laws of 1881.

II. "An act relating to local Boards of Health." Chapter CXXV., page 160.

III. A further supplement to an entitled "A supplement to an act entitled 'An act to establish a State Board of Health.'" Chapter CLIV., page 190. (Relates to animals.)

IV. "An act to provide for drainage where the same is necessary to the public health." Chapter CLVIII., page 195.

V. "An act to authorize the abatement of nuisances in cities and to make the cost and expense of such abatement a lien upon lands wherein such nuisances exist." Chapter CLIX., page 202.

VI. A supplement to an act intitled "An act for the improvement of the sanitary condition of cities." Approved March 14th, 1879. Chapter CCIX., page 261.

VII. "An act for the improvement of the sanitary condition of counties in this State." Chapter CCX., page 265.

VIII. "An act to prevent the adulteration of foods or drugs." Chapter CCXVII., page 283.

IX. "An act authorizing the construction of sewers or drains in certain cities where necessary to preserve the public health, although the limit of authorized expenditure for public improvements in such cities would thereby be exceeded." Chapter CCXX., page 288.

LAWS OF 1882.

I. A supplement to "An act to prevent the introduction of malignant and other infectious diseases into this State." Approved April 6th, 1871. Chapter XIII., page 17. (Relates to quarantine.)

II. A supplement to an act entitled "An act to provide for the assessment and payment of the costs and expenses incurred in constructing sewers and making other improvements in townships and villages." Approved March 12th, 1878. Chapter XXXIV., page 37.

III. "An act to authorize cities to construct sewers and drains and to provide for the payment of the cost thereof." (See, also, page 235, Laws of 1882.) Chapter L., page 61.

IV. "An act to provide for the licensing and regulating of milk dealers and their agents in cities, incorporated boroughs or police, sanitary and improvement commissions and incorporated camp meeting associations or seaside resorts." Chapter LXXIV., page 87.

V. "An act to prevent the adulteration and to regulate the sale of milk." Chapter LXXXII., page 97.

VI. Supplement to an act entitled "An act to establish a State Board of Health, etc. (Relates to animals.) Chapter C., page 133.

VII. "An act to provide for the better security of life and limb in case of fire in hotels and other buildings." Chapter CX., page 142.

VIII. "An act relating to the improvement of streets and the construction of sewers in the cities of this State." Chapter CXXXV., page 190.

IX. A supplement to an act entitled "An act concerning the protection of the public health and the record of vital facts and statistics relating thereto." Approved March 11th, 1880. Chapter CLV., page 217.

X. "An act for the preservation of the health of female employees." Chapter CLIX., page 227.

XI. A supplement to an act entitled "An act concerning the protection of public health and the record of vital facts and statistics relating thereto." Approved March 11th, 1880. Chapter CLXV., page 233.

XII. "An act to regulate the sale of petroleum and its products." Chapter CLXVIII., page 236.

XIV. "An act to provide for the appointment of commissioners to determine upon plans for the storage of any of the waters of this State for the purpose of furnishing to cities and towns a joint water-supply." Chapter CLXXXIX., page 264.

Beside these references, there are some laws which, without formal repeal, are made obsolete by provisions contained in the laws enumer-

ated. There are also in many general laws, charters, etc., provisions which bear more or less directly on the health of the people and its preservation. As a rule, such laws as have not their execution especially provided for are inoperative, although, sometimes, (see chapter LIX., page 227, 1882, as a specimen,) they hold up a desirable model. Some are local in their application although made general in order to answer constitutional requirements. For all cities, the careful preparation and publication of ordinances to conform to laws is important, and not infrequently for townships, also. Until precedents under recent laws are fully established, Boards should be sure to act where action is necessary, but should clearly ascertain the various legal modes of dealing with conditions hazardous to the public health, and under skilled advice choose the method which is most likely to be successful. Every local Board in this State has a very important sphere of usefulness, and when they do not succeed by judicious warning, by convincement of offending parties by giving information as to the reality of evils, by moral suasion, or by proper warnings, between the powers of indictment, of injunction and of authorized summary proceeding under sanitary police provisions, they have great legal support.

REPORT

OF THE

BUREAU OF VITAL STATISTICS

OF THE

STATE OF NEW JERSEY

FOR THE

Statistical Year from July 1st, 1881, to July 1st, 1882.

DEPARTMENT OF STATE.

TO HON. HENRY C. KELSEY, SECRETARY OF STATE.

By EZRA M. HUNT, M. D., Sc. D.

Medical Superintendent of State Vital Statistics.

INTRODUCTION TO THE REPORT ON VITAL STATISTICS.

SIGNIFICANCE OF VITAL STATISTICS.

The increasing recognition which is being given to the value and availability of vital statistics, as indicating the essential conditions of population and as directing us to feasible methods of preserving life and promoting the social advantage of the State, has already been noticed in former reports. As legal records bearing on inheritance, on life insurance, on pensions and various rights of property and of life, they have long been valued. As a census of the vital movements of population, they have always been considered indispensable in the record of social statistics. Halley, bringing the science of numbers to bear upon celestial reckonings, was the first to predict the time of the return of a comet. He conceived that life has also its accurate laws, and that a study thereof, by the collection of facts, could as well determine as to health, disease and longevity. He and others have taught how errors which would affect small numbers, are eliminated, when, by a law, we come to reckon as to tens and hundreds of thousands of people. So he proposed the life tables which are now so much a basis in life insurance. The three great events of birth, marriage and death each have their ascertained laws, which not only affect, but determine the welfare of States and nations.

MARRIAGE.

Statistics as related to marriage fulfil most important objects. First of all, in a legal point of view, it is recognized that a relationship so important and so affecting the rights of property must at the time of its occurrence have such certification and record as to place the proof thereof beyond doubt. Questions of age, of relationship, and of the transfer of great material interests must ever claim a careful and authentic registry. Law concerns itself with more than this. It

defines degrees of relationship, because the welfare of the State is concerned in consanguinity. It specifies the ages of subjection to parental consent, because up to a certain time it must hold fast to the doctrine of parental control as a State interest. It designates the persons or societies who have authority to perform or authenticate marriage, because clandestine marriage or too great laxity as to the persons by or circumstances under which such union may be made, is destructive of good order and not for the social welfare.

The great interest which the State has in the marriage relation needs to be duly considered. Not the man but the family is the social unit. The State needs to know more about its families than it does about its individuals. One who examines the various laws of the European States bearing on marriage will perceive that they have their start and growth in that State care which is requisite to secure good citizenship. They are not any of them arbitrary interferences with personal choices, but intended to be only such regulation or restraint as is essential to a good constituency for a good government. The requirement of previous announcement, the prohibition of night marriages and many other conditions, were conservative of the State at the time, and are less needed now only because other guards avail. In some of the New England and Western States license or previous notice of marriage is required. Public attention has recently, by a series of well-studied statistics, been directed to some facts as to the decadence of marriage. An able editorial of the past year refers to the harm done by the influences which operate on both sexes to prevent marriage. "We do not say to delay, but to prevent, for the alarming fact is not the numbers who delay to marry, but the numbers who believe they can achieve the ends and the happiness of life better without marriage. * * * The facts of sex are immutable. Since the world began but one method has been discovered to give sex its meaning without surrendering the race to the domination of passion. So fixed are these forces that the statistics of social vice follow in regular sequence the ratios of the married to the unmarried.

A bad state of morals is to be inferred from a low rate of marriage. However pure the considerations may be that hold individuals in both sexes back from wedded life, the result in the end is unfavorable to morals. The man has everything to gain in wedded life, which is implied in his civilization. * * * The woman, if possible, has even more to gain. It removes her from occupations which no regulation that has yet been devised has made safe and wholesome

for her, to another to which she is suited by nature. The large evil which threatens is back of divorce. There is something mandatory as well as permissive in the verdict of human experience, that the best social state is that in which one man lives with one woman as his permanent wife.

It is found to the interest of States to trace the ages at which persons enter wedlock; to compare the marriages of different nationalities; the relationship; the number of children; the effects of different occupations and social circumstances, and thus secure intelligent information as to the most material interest of the State—its population. These facts are to be accumulated and then tabulated, or kept on record ready for tabulation, until by numbers of facts we can perceive the forces, which, for good or evil, are affecting the condition of the people. It is not mere philanthropy or regulative morality, but governmental ethics, that demands this State care of population.

BIRTHS.

The study of the birth-rate of States and of cities as compared with country districts aids much in determining the variation of increase and decrease of population and the causes operating in either direction. However valuable a foreign immigration may be, children born after arrival here, or children of native citizens, are of a better average value to the State. It is even well when a State can present such inducements to its native born as to secure their settlement in it, or can cultivate a State love which is local as well as national in its attachments. With all that is said about the care and cost of large families, it is found that in all well-organized families of the laboring classes the children more than pay for themselves by the age of twenty-one. Indeed, the labor statistics of Massachusetts show the parents to be indebted to them for aid. The birth-rate is affected by discouragements to marriage, by improper practices and by decadence in health, especially that of mothers. While it is often difficult to analyze and state the proportion of limiting causes, even in seeking for them we get the value of a thoughtful consideration on the part of the people, as to the need of fostering parentage and infant life. We hear so much of our increase of population that we forget the small average of our population as compared with our unoccupied acres. A distinguished English statesman recently traveling in this country, when asked what was the greatest drawback to progress he had observed,

replied: "The absence of adequate population." A birth-rate of thirty-three per thousand does not represent a rapid increase. Any other than natural limitations to the birth-rate, or any causes which militate against families, are to be looked upon as evils, not less seriously by the statesman than by the moralist.

DEATHS.

The records of death and the requirements of a certificate before burial, have been found essential in many ways. It is not wise to permit life to be ended without some form of authentication of the cause and of the disposition made of the body. General Graham, as Registar-General of England, says: "Like the institution of the coroner's jury, this inquiry deters from crime, fosters a reverence for human life, and by discovering the causes of premature death in the various circumstances of the population contributes to the progress of the science of medicine, diminishes suffering and leads to the prolongation of life to its natural term." So invaluable have such records been in the study of the causes or occasions of disease that the progress of England in hygiene rests more on this basis than on any other. The government has proceeded on the basis which such statistics have furnished and has succeeded in averting death, in lessening disease and in lengthening life. Not only should the State have its general summary and give information and direction and that uniformity as to methods without which there cannot be adequate comparisons, but the local death-rates, and especially those of cities, need to be carefully watched from week to week and month to month. The sicknesses and deaths among the younger population are often the index of how far parents and older children are being subjected to insanitary conditions that embarrass labor or abbreviate life, even where no speedy sickness or demise follows. Dr. Farr once traced the ages, history, etc., of 100,000 decedents from birth to death, noticing the age at death and the causes. In various forms vital statistics seek thus to trace the life and death history of population. Thus it puts itself in the possession of a knowledge of causes, so as to limit their potency or entirely remove some of them. We refer to articles in our previous reports showing how these laws are to be studied and what are the best ascertained methods of conducting such vital statistics; vital not less to the State in its prosperity and numerical progress, than to persons and to families in health, thrift and happy citizenship.

The number of deaths that occur at the early ages of life is very significant as to the vitality of any particular community. While the number for a single year may depend on some local epidemic, the average through a series of years is a very correct record of the vigor of the population. So the ultimate capacity of a nation can quite accurately be foretold by a close study of its vital statistics through a series of years. Forewarned is forearmed, not less to society than to individuals. Through such records States must study their tendencies to decadence, and so check the progress or interpose compensating influences. It is the misfortune of insanitary conditions not only to kill multitudes at an untimely age, but so to enfeeble or reduce race-vitality as to lower the health standard of those that live. Thus the deaths measure the entailments to the living and to their ancestry.

An accurate knowledge of the relation of the death-rate to local conditions, aids very much in the diagnosis, the treatment and the prevention of illness.

Physicians are now watching, also, more closely the types of disease as they are modified by earth structure, topography, climate or by insanitary conditions in the person. We now fail not so much from deficiency in the aggregate of available and life-preserving knowledge, but in our personal possession of such knowledge, and not less in our ability to enforce what we do know upon the popular mind. We shall never attain perfect correctness of methods, but the two most forward steps thereto are to know what is correct and to obtain so far as State, municipal and other local governments are concerned, a power to execute so far as is feasible. The success which has attended other governments and States in this direction is the guaranty that our efforts in the same direction will be of service.

We are forced to study not only the vital but the social conditions of our population by the light afforded through the study of the forces which affect health and life. It is essential, if in one section of the State the population is dying at the rate of thirty to thirty-five per thousand and in another at only sixteen or seventeen per thousand, that we ascertain the causes of the difference. Especially as so many of these causes are to be found within the reach and duty of control. All the more because the epidemic originated or fostered by private or public filth does not stop amid its degraded beginnings, but invades the homes and the persons of those who have been personally careful. It is for this reason that no health administration is perma-

nently effective which does not secure the numerical statement of marriages, of births and of deaths, in order that it may have them as the record of actual results, as the guides to observation and as the indices of those preventive methods which limit or abate such devitalizing influences as enfeeble, demoralize and destroy the people.

COMPARATIVE FACTS IN CLIMATOLOGY AND GEOLOGY,

As Needed in the Study of Vital Statistics and the Causes of Disease.

BY THE MEDICAL SUPT. OF S. V. S.

In the study of the population of New Jersey, with a view of determining how the health of its inhabitants can be best maintained, we need to know something of its physical geography, its earth structure, its water systems, its atmosphere and its climate. In other words, we need to know its natural locality and its telluric or geological construction, so far as these influence health and life or produce or modify the diseases which occur. It is no longer doubtful that localities differ much in their healthfulness; that we are able to estimate the reasons of difference and often to improve or injure the vital force of the location by structural changes.

We desire here briefly to notice a few of those physical, geological and climatological facts that are of essential import in guiding us in the close local and comparative study of population as related to its locality.

The geological structure of New Jersey is such as to admit of quite distinctive study. As soil or surface depends chiefly upon the character of the formation beneath, we first find out what this is, then how far it has been modified.

Rock or earth structure is spoken of as *primitive* or of the (I.) azoic (eozoic) time or age, when there was no animal life on the earth; as of a transition or (II.) paleozoic time, when life in some forms began to appear; as of a (III.) secondary or mesozoic time, to which, among others, belong the triassic or new red sandstone and the cretaceous formations, and (IV.) the tertiary or cenozoic time, with its tertiary and recent formations.

Now, so distinct are these various formations in this State, that, with the exception of the azoic and paleozoic formations, occurring in the north of the State, they can be and are represented on separate

maps, while the first two, although on one map, are shown quite distinct.

The azoic rocks make up the mountain ranges or Highlands which cross the northwestern part of the State, and which are known by the names of Ramapo, Warwick, Hamburg, Pochuck, Schooley's, Mine, Musconetcong, Scott's, etc. They cover an area of about 772 square miles. The northeastern end of the belt in this State is rough and much of it still in forest. Of the southwestern end a considerable portion is cleared and in good farms. With this exception, it is somewhat sparsely inhabited.

The paleozoic rock is mostly of the silurian variety, composed of sandstones, limestones and slates. These formations occupy many of the valleys between the mountains of azoic rock and the whole of a belt of country 15 to 20 miles wide, northwest of and adjoining these mountains. The rich farming lands of Sussex and Warren counties are on the magnesian limestone, and the grazing and dairying lands are on the slates. The area covered by these formations is about 650 square miles.

The devonian rock, another division of the paleozoic, has a very limited exposure in New Jersey, along the Delaware, from the New York State line to the Walpack bend. The area included is about 40 square miles. There are some valuable limestones and some good soils, but much of it is encumbered with drift. Thus, then, the 772 square miles of azoic rock and the 650 of paleozoic rock are the only two that cannot be on separate maps, and these are thus sufficiently outlined for sanitary study. (For full details see the State geology and subsequent reports and maps.)

The secondary or mesozoic time has two prominent and distinct distributions, viz., the triassic or new red sandstone formation and the cretaceous formation. The triassic or red sandstone formation occupies the belt of country which crosses the State from northeast to southwest and is next southeast of the azoic region. It is about 20 miles wide and extends entirely across from the Hudson to the Delaware. Its area is 1507 square miles. Almost the whole of Bergen, half of Passaic, all of Essex, Union and Hudson, a part of Morris, most of Somerset and Hunterdon and considerable portions of Middlesex and Mercer counties are of it. Its southeast border is nearly on a straight line between Jersey City and Trenton. Its rocks consist of sandstone, shale and trap; the former two of sedimentary and the latter of igneous origin. Generally the shales disintegrate more rapidly than the sand-

stones. These two are characterized by their red color. Their surface is diversified by many abrupt mountain ridges of trap-rock.

The cretaceous formation is found immediately southeast of the red sandstone in a long, narrow strip that reaches from Raritan and Sandy Hook bays to the head of Delaware bay, near Salem. It is 90 miles long and from 12 to 15 wide, and has an area of 1491 square miles. It includes parts of Middlesex, Mercer, Monmouth, Ocean, Burlington, Camden, Gloucester and Salem counties. The white clays occupy the northwestern side of the belt and the green-sand marls the southeastern side.

The tertiary or cenozoic time is almost entirely limited to the southern portion of the State. These formations cover the counties of Atlantic, Cumberland and Cape May, and most of Ocean and Burlington; Camden, Gloucester, and Salem are partly occupied by them, and also a small portion of Monmouth. They consist of sand and clay covered with a thin soil, not very productive. Some of the clay has shells enough to be called marl. Extensive beds of white sand for glass-makers' use are common.

Still more recent formations of the same general character are sometimes known as *Post-Tertiary*. The glacial drift hereafter to be noticed, which covers much of the northern third of the State; the banks of sand gravel which in the form of terraces or level-topped hills, occupy much space in valleys; the alluvial deposits along the borders of streams, and the tide marshes and the sand beaches which border the State along the sea side, and on Delaware bay, are formations which belong to this division.

To this extent a knowledge of earth foundations is necessary in order to an intelligent survey of ground influence upon health; not only does it concern questions as to the level of ground water, and drainage, but the well water is modified, as, for instance, we know in limestone formations. While it is true that topography and forests and various other surface relations have their influence on climate and on constitutions, yet we are not to overlook the relations of the deeper structure. But especially "as soils are formed from rocks, they must necessarily have some qualities in common with the rocks." The usual designations of loamy, clayey, etc., are too indefinite. It is better to base the classification of soils on the geological structure of the particular district, and after to note such modifications as are produced by drift, by washing or by any change, natu-

ral, accidental or artificial, which has been made, and which tends to influence animal or human life.

The classification given by Prof. Cook, the State Geologist, based on geological origin, is as follows:

1. *Granitic.*—The soils on the azoic rocks, and which have evidently been formed from the decomposition or disintegration of the gneiss, hornblende and granite rocks of this formation. They are designated on the map by a crimson or carmine color.

2. *Limestone*—The soils which overlie the crystalline, magnesian, and Helderberg lime-rocks, and have been formed from these rocks by the solution and removal of most of the lime, leaving the earths and impurities of the stone for the soil. Each of these soils and rocks is designated by a blue color.

3. *Slate*—The soils which are on the Hudson river slate, the Oriskany sandstone, and the Cauda-galli grit, and have been formed by the simple disintegration of those rocks. These soils are usually more or less clayey. They are colored on the map of a neutral tint.

4. *Red Sandstone and Shale*—These soils have been formed by the disintegration of the rocks on which they are found. The color on the map shows their location.

5. *Trap*—Is the soil which is formed by the decomposition of trap-rocks, and is found on them. An olive-green color is used on the map to designate this soil.

6. *Clay and Sand*—Designates the soils which are found on the outcrop of the formations of white clays and sands of the lower member of the cretaceous period. These soils are designated by a yellowish color.

7. *Marl Soils*—Are those which are on the outcrops of the clay marls, lower marl bed, red sand, middle marl bed, yellow sand, and upper marl bed. They are marked by the green-sand in them; often sandy. On the map they are colored different shades of green.

8. *Silicious Soils*—Include all those in which quartzose or silicious matter largely predominates. They are designated on the map by a yellow color of different shades, and the following subdivisions are distinguished:

a. Quartz-rock—Soil which is on the conglomerate of the Green Pond mountain, and on the Oneida conglomerate and the Medina sandstone of the Kittatinny mountain. These lands are all in forest.

b. Pine-land—That soil which is found in portions of Southern

New Jersey, and on which *only* yellow pine ever grows. It is formed from the glass-sand and the water-sorted, gravelly earth.

c. Oak-land—That soil which is found in portions of Southeastern New Jersey, and on which oak timber grows. It is the unsorted gravelly earth of the post-tertiary age.

d. Miocene—The soil found on the miocene marl of Cumberland county.

9. *Glacial-drift Soils*—Are found in all the northern part of the State, and north of the Terminal Moraine. These soils are somewhat like the rocks on which they lie, but their composition is changed by the addition of earth brought by the glaciers from the rocks farther north.

10. *Alluvial*—Is the name given to the soils which make the tide marshes—those which are along the borders of the uplands and only a few feet above tide-level, and also to those which make up river flats. They are designated to some extent on the map by fine-ruled black lines.

Some of these soils result from the modification of the original geological soils by deposits of various kinds which can be traced. As these surface beds or admixtures with the natural rock soil affect the soil and the flora, so also there is a modification of sanitary conditions. Sometimes it is in the organic character of the material itself and sometimes it is the change it makes in what would otherwise be the drainage or natural contour. This geology of the surface is, therefore, of much importance in the study of life and of its diseases.

These surface deposits have been referred to under the division of Tertiary or Recent Formations, but as they are still more recent than the Tertiary, geologists often designate them as belonging to a fourth class, known as the Post-Tertiary or Quaternary period. To fully exhibit these, it is only necessary to refer to the valuable article on surface geology marked V (pp. 14–97) in the annual report of the State Geologist for 1880. The effects of the glacial drift with its great terminal moraine and its moraines of recession, the modified glacial drift, the transported glacial drift, and the pre-glacial drift, are there fully outlined and described.

The lake basin of the Great Meadows in the valley of the Pequest; the glacial lakes, such as Green lake, and the transfer of its entire water-shed and drainage into the Rockaway river instead of the Pequannock; the thick drift in the Delaware river valley, and that of Flat brook and Mill brook; various alluvial deposits; the great temporary

lakes formed by the modified glacial drift, such as that thirty miles long and six to eight wide, now covered by towns, made by the ice of the receding glacier at Paterson and having final outlet in the valley of the Passaic; the transported drift along the Delaware river south of the terminal moraine, and the pre-glacial drift of the southern part of the State of so different a character; all illustrate a study of the greatest import in its bearing on questions of surface biology, of drainage for health, and on diseases as thus modified.

Our attention has been very closely called to a study of periodic fevers and malarial influences, under the guidance which these lines of demarcation furnish. Future students of the telluric or earth conditions which affect population, will be as successful in showing the economic bearing of such studies as have been the geologists in bringing order out of chaos and in defining the laws of industrial development. For our natural resources are as much in a preserved and healthy population as in the ground on which it treads.

In addition to these sanitary outlines of deep and of surface geology, we need also to bear in mind those surface changes which have been made by the upheavals and infillings of constructive art. Canals and railroads are so numerous as quite to have altered surface soil and surface contour in whole districts. The excavations of mines often make hills from the buried earth and valleys or pond holes of grave import to health. The iron, the marl, the glass sand, the clay and other industries that involve displacements of ground have made many such changes in this State.

Also, the fact that so many towns have sprung up near the outlets of rivers into tide-water, has caused many a marsh to be covered over without adequate drainage, sometimes by materials totally unfit for filling in. Any one who will study the sanitary map of Hudson county, as prepared under the supervision of this Board, or that of Elizabeth, will see the significance of these changes. Similar ones are being made in many of our sea-coast towns. All excavations for buildings also have their bearing on surface geology. It is for this reason that all basements and other like excavations, and especially those in cities, need to be carefully studied in relation to soil formation and drainage. The effect of such changes is often made apparent in the records of disease, and so the need of remedy indicated.

Having thus acquainted ourselves with the material earth on which we live, or which is adjacent to us, we need still more particularly to study the topography or contour of its surface. When we follow the

courses of its mountains and valleys, its rivers and lakes, and the bordering of bays and ocean, the student of physical geography is able to estimate with more or less accuracy the bearing of these on vegetable and animal life and especially upon that of human beings. Indeed, just as the flora and fauna of a district guide to its character, so the diseases often serve to describe the telluric conditions. As close observers and series of well-observed facts increase, the relations become apparent, and what is at first entertained as a working hypothesis, becomes an ascertained fact and a practical guide in conserving health. Now that we have a topographical map of Northern New Jersey and will have one for the whole State, we have great advantages for such inquiries. Besides the effect of earth structure and surface elevation, or of large bodies of water, we need also to know of the woods as great condensers, and of all vegetable and soil and earth-covering as modifying moisture or other elements of climate in a way admitting of approximate estimation.

But the most important modifying factor as to surface geology as related to health is that which depends upon the river system and the various water-sheds of the State. These are well presented in the river system of New Jersey as tabulated on pages 276 and 277.

RIVER SYSTEM OF NEW JERSEY.

ATLANTIC OCEAN.	Hudson River.	Wallkill.	Black Creek.	
			Wallkill	
			Papakating River.	
	NEWARK BAY.	Passaic River.	Pompton River	Ramapo River
				Wanaque Creek.
				Pequannock River.
			Passaic River.	
			Rockaway River.	
			Whippany River.	
		Hackensack River.	Saddle River.	
	RARITAN BAY	Raritan River.	North Branch.	Black River.
				Lamington River.
			South Branch.	
			Millstone River.	Stony Brook
			Green Brook	
			South River.	
	Staten Island Sound	Rahway River		
	Sandy Hook Bay.	Navesink River.		
		Shrewsbury River		
	Shark River Inlet	Shark River.		
	Manasquan Inlet	Manasquan River.		
	Barnegat Bay.	Metedeconk River.		
		Toms River		
		Cedar Creek.		
	Great Bay.	Little Egg Harbor, or Mullicas River.	Mullicas River.	
			Wading River.	
			Batsto River	
	Egg Harbor.	Great Egg Harbor River.	Tuckahoe River.	
	DELAWARE BAY	DELAWARE RIVER	Flat Brook.	Big Flat Brook
				Little Flat Brook
			Paulinskill	
			Pequest River.	
			Pohatcong River.	
			Musconetcong River.	
			Assanpink Creek.	
			Crosswicks Creek.	
			Rancocas Creek.	North Branch
				South Branch.
			Cooper's Creek	
			Big Timber Creek.	
			Mantua Creek.	
			Raccoon Creek.	
			Oldman's Creek.	
			Salem Creek	
			Alloways Creek	
		Cohansey Creek.		
		Maurice River		

RIVER SYSTEM—CONCLUDED.

NAME.	Length in Miles.	REMARKS.	Drainage Area. Square Miles.
Black Creek	10	To the State line	
Papakating River	15	To the junction with the Wallkill	
WALLKILL	25	To the State line	203
RAMAPO RIVER	33	From the State line to the Pompton	47
Wanaque Creek	19	From the State line to the Pompton	89
Pequannock River	40		95
Rockaway River	38		165
Whippany River	19		59
PASSAIC RIVER	80		974
Saddle River	18	From the N. Y. line to the junction with the Hackensack	57
HACKENSACK RIVER	30	From the State line to Newark Bay	132
Lamington River	25	Including the Black River	135
North Branch	24		85
South Branch	50		280
Millstone River	35		280
Stony Brook	20		55
Green Brook	15		63
South River	30	Including Manalapan Creek	122
RARITAN RIVER	80	Including the South Branch	1000
RAHWAY RIVER	22		62
Navesink River	22	Including Swimming River and Hop Brook	88
SHREWSBURY RIVER	10		20
SHARK RIVER	11		
MANASQUAN RIVER	22		60
METEDECONK RIVER	22	Including the North Branch	100
TOMS RIVER	80		157
CEDAR CREEK	20	Including the East Branch	70
Batsto River	18		70
Wading River	28	Including the East Branch	140
LITTLE EGG HARBOR OR MULLICAS RIVER	42		476
TUCKAHOE RIVER	26		100
GREAT EGG HARBOR RIVER	41		425
Big Flat Brook	14		
Little Flat Brook	9		
Flat Brook	10	From the junction of Big and Little Flat Brooks	50
Paulinskill	38		163
Pequest River	30		168
Pohatcong Creek	26		58
Musconetcong River	40		162
Assanpink Creek	21		105
Crosswicks Creek	25		151
Rancocas Creek	32	Including the North Branch	329
Cooper's Creek	17	Including the South Branch	55
Big Timber Creek	15	Including the South Branch	56
Mantua Creek	18		51
Raccoon Creek	29	Including the North Branch	53
Oldman's Creek	23		43
Salem Creek	34		109
Alloways Creek	18		285
DELAWARE RIVER	220	From Carpenter's Point to Delaware Bay, including large and small tributaries	2100
COHANSEY RIVER	31		100
Maurice River	45	Including Little East River	360

SUMMARY OF DRAINAGE AREAS OF NEW JERSEY.

The Hudson River receives through the Wallkill and its tributaries in New Jersey the drainage of	203	sq. miles.
The Hackensack River drains	130	"
The Passaic River drains	980	"
The Raritan River drains	1,000	"
The Delaware River drains	2,100	"
The Maurice River drains	360	"
The Mullicas or Little Egg Harbor River drains	476	"
The Great Egg Harbor River drains	125	"
Total	5,674	sq. miles.

The above-named rivers are the larger streams in the State, draining about seven-tenths of the whole area. The remaining three-tenths are drained by the numerous smaller streams that empty either directly into the Atlantic ocean, or into the bays which lie along the coast.

Classified according to the Atlantic and Delaware river and bay slopes we have the following result:

The Delaware River and Bay receives the drainage of	2,850	sq. miles.
The Atlantic Ocean	4,523	"
The Hudson River	203	"
Total area of the State	7,576	sq. miles.

Such lakes as Lake Hopatcong and Budd's lake, in the highest part of the Highlands, Greenwood lake, in Passaic county, or Green pond, and many other smaller sheets of water known as lakes or ponds, need to be studied in respect to adjacent drainage, and to the water and land area they represent.

The various bays along the coast not only have a sea and river connection, but amid the tide-marshes are various creeks, quite complete in their connections with each other and needing much to be studied in their bearing on the health of localities, and especially as to the indications whether or not to use them as conduits for sewage.

The rain-fall also needs to be borne in mind in its relation to water-courses, water-supply and drainage. This is not the measure of humidity, because the quantity of moisture in the air is subject to changes which are not always expressed by atmospheric precipitation, either in the form of rain or snow. As the humidity can be measured as well as the rain-fall, we have means of recording their relation to each other, to temperature, &c. The rain-fall of the State may in general be noticed as increasing in depth in going from north to south and from northwest to southeast. Before a station was established at Newton, Goshen, in Orange county, with an average of 33.82 inches for eight years, served as an approximation. Easton, Pa., gives a

record for five years of 45.56 inches. These mark the extremes of the azoic and paleozoic districts. Paterson has the average for five years of 60.69 inches, and has long been noticed for its excessive rain-fall, which is above the region it represents. Newark, for thirty-nine and eight-tenths years, has an average of 46.48 inches; New Brunswick, for twenty-nine years, of 45.42 inches; Freehold, for eight years nine months, 46.39 inches; Vineland, for seventeen years, 49.00 inches; Cape May, for eleven years six months, 47.30 inches; Sandy Hook, for nine years, 51.99. While it is well to have these general outlines, both humidity and rain-fall need to be studied by days and weeks in relation to temperature, to former or succeeding droughts, to freshets or sudden rain-falls in short periods, and so watched as affecting sudden increases or decreases of disease, the local and general tables of vital statistics being compared therewith.

It is very evident that, in the care of the public health, great attention must be given to the preservation of the natural drainage or to its substitution where, for any reason, the natural channel is interfered with. Also, to the multiplication of drainage channels where population is crowding into smaller areas.

Whether a given stream or part thereof is to be preserved wholly for drainage and water-supply, or whether it shall be made available for mill-dams or for the delivery of sewage, and if so, whether it can, in whole or in part, be used as a water-supply? These are questions so much depending upon locality, upon river-bed, upon course and rapidity of current, upon rain-fall and upon the relations of cities, that they need to be discussed specifically as regards each area, rather than to be decided by general statements.

A comprehensive study of health and of vital statistics must take all these into account as well as the sea front, the various bays and creeks and the tide-marsh, and closely consider those parts of the State which stand in need of extended drainage. English and American observation and medical experience so establish the connection of undrained localities or interrupted water-courses and forced vegetable decompositions with malarial fevers, with consumption and other lung diseases, as well as with zymotic diseases, resulting from dampness and filth and heat combined, that we must, in the interests of population, closely compare the results in the State as variously, but definitely, modified by local conditions.

CLIMATOLOGY.

Connected with this and partly as an outcome therefrom, is the study of CLIMATOLOGY as related to earth structure. It is "the science which treats of the causes which affect the climate of a particular place."

It is a mistake to regard climate as a mere question of longitude and latitude, with which we have no concern. Were this true we would study its laws, if definite, so as to adapt ourselves thereto, or to seek such as we needed. But, as besides this, climate is itself modified by local conditions and its effects upon us personally admit of being modified both by our mode of dealing with ourselves and our surroundings, we cannot lose sight of a certain causal or modifying relation thereto. If all diseases were, as some are believed to be, dependent on the presence of septic particles having specific vegetable life, yet as development or power for malignant harm depends "upon the abundance and kind of pabulum furnished," and upon winds, moisture or other climatological conditions, we need to know how to estimate each of these.

One of the first questions that addresses itself to the sanitarian is how far it is practicable to study climatology and the relation of the earth in seeking the prevention or mitigation of disease.

With very many there is an impression that most diseases are either a result of weather conditions, or that their mildness or malignity is very much determined thereby. There is enough of connection between weather and disease to give credence to this view. We know that seasons have diseases quite peculiar to themselves and that different degrees of heat or cold or humidity are very sure to increase or decrease the mortality from certain diseases. These may be called the more general influences.

"Catarrhal fever," says Prof. Pepper, "arises from the ordinary causes of catarrhal inflammation, of which atmospheric conditions and changes are by far the most common cause." If we associate with this the remark of Reindfleisch, that "the larger half of all the diseases to which humanity is liable, consist of catarrhal affections of mucous membrane, or of disorders complicated with them," we see that locality must rank as an important factor.

In another class of cases, the specific causes of disease are either atmospheric in their origin or are so conveyed by winds or by dampness as to be transferred from one locality to another. The westward movement of cholera, the advance of influenza, and the uniform pro-

gression of some of the epizootics are beyond controversy. The term "epidemic constitution of the atmosphere" does not mean precisely what was intended by it in its first use, but it does mean a condition of atmosphere either producing, or conveying, or favoring, the spread of a disease. But what is spoken of as "the epidemic constitution of the atmosphere," is often only potent because art has laden or modified the atmosphere; because abnormal local filth or decomposition, either in the person or surroundings, gives the prolific soil or stagnant moisture and accumulated heat force it into intense productivity.

It seems that contagious particles or the entities of various diseases have different relations to the atmosphere. Some cling to the surface of the ground or other surfaces. Some are more easily wafted hither and thither. This may depend on a varying specific gravity or other conditions which modify the laws of diffusion. For instance, we can conceive of particles so coated with a film of oil as not to be readily diffused in the atmosphere. We have evidences that a stratum of air sometimes moves through the other strata and seems to preserve an individuality that does not readily admit of dilution. In passing over hills or amid marshy lands, even where the same sunshine reaches us, or in riding the open country, we pass through strata of air greatly differing in temperature and in organic impurity. How the rapid removal of forests or the upheaval of soil affects humidity, rain-fall and general temperature and has modifying results on climate and health, is already known.

Admitting that human control over weather conditions is partial and inadequate, this would not prove that the study is not of practical sanitary usefulness. There still would remain that more essential and life-saving study of the especial local conditions which under specified states of weather cause the greatest disturbance of vital functions. Much of the prowess of a good sanitarian, like that of a great general, is in his genius for thwarting combinations. The divisions of the great army of destruction must not be allowed to join forces. The victory is in preventing the massing of the forces, and that victory means saved lives. It is by close record of the effects of the same climatic conditions upon varying conditions of population and their surroundings that we come to know what are the safest and what the most dangerous methods of life. The different records of city and country in the same vicinity, or of different blocks in the same city, may show both what conditions of weather are most fraught with

risk and just where and why the risk is greater at one point than at another.

It is by just such studies as these that we are able approximately to determine what conditions of weather or climate produce the most favorable or unfavorable results on disease. Already there are enough gleams of knowledge to show that the facts are discoverable, although for so many reasons difficult of discovery. This justifies the acumulation of the facts, but does not justify artificial combinations of the facts, or some generalizations in which we are slow to concur. The labors of such men as Mr. Glaisher, of England, and Professor Loomis, of America, show what progress is being made by those who study with closest accuracy, and give promise of results such as must have important bearings upon the prevention of disease.

The importance of the subject still more impresses itself upon our attention from the fact that so many varieties of climate can be found within the State. Our northern boundary is in great contrast with our extreme south; while from east to west and from mountain to seashore there are diversities of climate such as no other State in the Union can present. The southern and eastern portion of the State, a region about one hundred miles long from north to south, and thirty-five miles wide from east to west, is remarkable for the small extremes between the mean temperature of summer and winter. "In the *average daily range of temperature*, Cape May is more equable than *Aiken, S. C., Jacksonville, Fla., San Diego, Cal., San Antonio, Texas*, and many other noted health resorts. In fact, in the low range it comes near Key West. Of course its *minima* are lower than those of the above-named places—although the differences are not so great as differences of latitude would lead us to expect." By accurate and long records of the weather conditions of localities and of the effects of our various climates in various diseases, we shall come to know what changes of locality to advise and how the health of our citizens can thus be conserved. It is often quite interesting to notice how atmospheric conditions are modified by difference of exposure, by prevailing winds or protection therefrom, by ground moisture, by bodies of water, by woodlands, or of dry, loose, uncovered soils, or by the relations of mountain and valley, of lake and ocean. Thus the study of climatology, or of the weather, is not merely a study of meteorological conditions.

The facts as to climate are to be deduced from various records and observations accurately made and stated, and then alongside of these

a similar record of disease. This record does not fail to show ascertainable and often controllable relations.

It is of interest to note how within a few miles changes occur, and how real are the advantages which sometimes follow from changes that involve only short distances of travel.

Our comparative studies of climatology, or weather conditions, date from July 1st, 1878, when our present system of vital statistics commenced. As the meteorological observations cannot and need not be made in every township and city of the State, we give observations at points which fairly represent the natural geological and climatological districts into which the State is divisible.

I. Newton, Sussex county, will be taken to represent the Kittatinny valley, and the sandstone, slate and adjacent rock.

II. Paterson, located on trap rock, well represents some slight variations for the same general district, and so the two stand for Northern New Jersey, or that part mostly of azoic and paleozoic formation.

III. Newark will represent the eastern part of the red sandstone section.

IV. New Brunswick, Princeton and Trenton will represent the western red sandstone section.

V. Freehold, amid the sand and clay marls, will represent the cretaceous formation, as well as in general the inland portion of Monmouth county.

VI. The tertiary formations and the climate as varied by relations of land and water, will be shown by Vineland.

VII. Cape May, on a similar sandy formation, stands for the Atlantic coast of the extreme south, with the adjacent influence of Delaware bay. Here and at Barnegat we rely on the Signal Service report. That of Barnegat is the one at hand this year.

VIII. Either Middletown, Red Bank or Sandy Hook represents our northern Atlantic coast and the minglings of sand and of clay marls of cretaceous formation.

Other points of comparison are afforded by the records of the Signal Service. (See, also, page 284 of Fifth Report.)

The records at some of these points are slightly defective, but can be supplied by adjacent data in time for semi-decennial comparison. We have now perfected a system so as to secure reports from each of these points, which we believe will be permanent and reliable and much aid to sanitarians in their comparisons. Each city of over 5000 inhabitants should avail itself of weekly or monthly reports so as to study the immediate connection with varying death-rates.

The observers are as follows:

Newton, Miss E. Foster.

Paterson, J. S. Hilton, C. E.

Newark, Hon. Wm. A. Whitehead, or Arthur Ward, M. D.

New Brunswick, Prof. J. C. Smock.

Freehold, Chas. F. Richardson, A. M.

Vineland, John Ingram, M. D.

Middletown or Red Bank, Frank Osborn, C. E.

Barnegat, Cape May, etc., United States Signal Service.

Physicians or climatological observers, who will, at least every three years, furnish to this Board their judgment as to local causes of disease, will at any time, on notice by postal, be furnished with a geological map for comparisons.

NOMENCLATURE, OR THE REVISED CLASSIFICATION OF DISEASES.

"The *nomenclature* is of as much importance in this department of inquiry as weights and measures in the physical sciences. The superiority of a classification can only be established by the number of facts which it generalizes, or the practical results to which it leads.

"A statistical nosology, to throw the clearest light upon the health of a nation, should be founded upon the mode in which diseases affect the population."—*Farr*.

The great progress which has been made in medical knowledge has necessitated many changes in the names and orders of disease. These have been from time to time made with great care, as new discoveries in pathology have indicated. The one until recently in use in England, Scotland and Wales had been changed but little within twenty years. It had been reprinted in this country by the Hospital Marine Service and generally accepted by physicians and in all offices of vital record. In 1880, the National Board of Health invited a conference of the principal Bureaus of Vital Statistics in the United States. A similar recognition of the need of correction was entertained by the Registrar-General of Great Britain. Conferences were had with a committee appointed by the United States and a careful review of the nomenclature was instituted. This has resulted in the adoption of some modifications which are used for the first time in the English reports recently printed. While reference to the instructions and nomenclature, as published by this Board in 1878, is important, we herewith give the classification as now adopted:

LIST OF DISEASES REPORTED AS CAUSES OF DEATH ADOPTED IN THE NEW FORMS OF THE REGISTRAR-GENERAL OF ENGLAND.

[It will be understood that the names of the groups are provisional only. Asiatic cholera and yellow fever would be placed under miasmatic diseases.]

I.

SPECIFIC FEBRILE DISEASES, OR ZYMOTICS.

1. *Miasmatic diseases.*

Small-pox { Vaccinated. / Unvaccinated. / No statistics.
Chicken-pox.
Measles.
Epidemic rose-rash.
Scarlet fever.
Typhus.
Relapsing fever.
Influenza.
Whooping-cough.
Mumps.
Diphtheria.
Cerebro-spinal fever.
Simple continued fever.
Enteric fever.
Other miasmatic diseases.

2. *Diarrhœal diseases.*

Simple cholera.
Diarrhœa, dysentery.

3. *Malarial diseases.*

Remittent fever.
Ague.

4. *Zoogenous diseases.*

Hydrophobia.
Glanders.
Splenic fever.
Cow-pox and vaccination.

5. *Venereal diseases.*

Syphilis.
Gonorrhœa, stricture of the urethra.

6. *Septic diseases.*

Phagedæna.
Erysipelas.
Pyæmia, septicæmia.
Puerperal fever.

II.

PARASITIC DISEASES.

Thrush.
Other vegetable parasitic diseases.
Hydatid disease.
Other animal parasitic diseases.

III.

DIETIC DISEASES.

Starvation, want of breast milk.
Scurvy.
Intemperance. { **Chronic alcoholism.** / **Delirium tremens.**

IV.

CONSTITUTIONAL DISEASES.

Rheumatic fever, rheumatic heart.
Rheumatism.
Gout.
Rickets.
Cancer, malignant disease.
Tabes mesenterica.
Tubercular meningitis.
Phthisis.
Scrofula, tuberculosis.
Purpura, hæmorrhagic diathesis.
Anæmia, &c.
Diabetes mellitus.
Other constitutional diseases.

V.

DEVELOPMENTAL DISEASES.

Premature birth.
Atelectasis.
Cyanosis.
Spina bifida.
Imperforate anus.
Cleft palate, hair lip.
Other congenital defects.
Old age.

VI.

LOCAL DISEASES.

1. *Diseases of nervous system.*

Inflammation of brain.
Apoplexy.
Softening of brain.
Hemiplegia, paralysis.
Paralysis agitans.
Hydrocephalus (not acute.)
Insanity (general paralysis of insane.)
Chorea.
Epilepsy.

Convulsions.
Laryngismus stridulus.
Idiopathic tetanus.
Paraplegia and disease of cord.
Others, nervous system.

2. *Diseases of organs of special sense.*

Otitis, otorrhœa.
Epistaxis and disease of nose.
Ophthalmia and disease of eye.

8. *Diseases of circulatory system.*

Endocarditis, valvular disease.
Pericarditis.
Hypertrophy of heart.
Angina pectoris.
Syncope.
Aneurism.
Senile gangrene.
Embolism, thrombosis.
Phlebitis.
Varicose veins.
Others, circulatory system.

4. *Diseases of respiratory system.*

Laryngitis.
Croup.
Others, larynx, trachea.
Emphysema, asthma.
Bronchitis.
Pneumonia.
Pleurisy.
Other diseases of respiratory system.

5. *Diseases of digestive system.*

Stomatitis.
Dentition.
Sore throat, quinsy.
Dyspepsia.
Hæmatemesis.
Melæna.
Disease of stomach.
Enteritis.
Ulceration of intestines.
Ileus, obstruction of intestines.
Stricture and strangulation of intestines.
Intussusception of intestines.
Hernia.
Fistula.

Peritonitis.
Ascites.
Gallstones.
Cirrhosis of liver.
Others, liver disease.
Others, digestive system.

6. *Diseases of lymphatic system.*

Disease of lymphatics.
Disease of spleen.

7. *Diseases of gland-like organs of uncertain use.*

Bronchocele.
Addison's disease.

8. *Diseases of urinary system.*

Nephritis.
Bright's disease, albuminuria.
Uræmia.
Suppression of urine.
Calculus.
Hæmaturia.
Disease of bladder and prostate.
Others, urinary system.

9. *Diseases of reproductive system.*

a. Diseases of organs of generation.

Ovarian disease.
Disease of uterus and vagina.
Disorder of menstruation.
Pelvic abscess.
Perineal abscess.
Disease of testes, penis, &c.

b. Diseases of parturition.

Abortion, miscarriage.
Puerperal mania.
Puerperal convulsions.
Placenta prævia, flooding.
Phlegmaria dolens.
Other accidents of childbirth.

10. *Diseases of locomotor system.*

Caries, necrosis.
Arthritis, ostitis.
Others, locomotor system.

11. *Diseases of integumentary system.*

Carbuncle.
Phlegmon, cellulitis.
Lupus.
Ulcer, bed-sore.
Eczema.
Pemphigus.
Others, integumentary system.

VII.

DEATH FROM VIOLENCE.

1. *From accident or negligence.*

Fracture, contusion.
Gunshot wounds.
Cut, stab.
Burn, scald.
Poison.
Drowning.
Suffocation.
Otherwise.

2. *From homicide.*

Murder, manslaughter.

3. *From suicide.*

Gunshot wounds.
Cut, stab.
Poison.
Drowning.
Hanging.
Otherwise.

4. *By execution.*

Hanging (execution.)

VIII.

DEATHS FROM ILL-DEFINED CAUSES.

Dropsy.
Debility.
Atrophy and inanition.
Mortification.
Tumor.
Abscess.
Hemorrhage.
Sudden (cause unascertained.)
Not specified, or ill-defined.

CONDENSED

CLIMATOLOGICAL RECORDS,

FOR FOUR STATISTICAL YEARS,

Commencing July 1st, 1878, and ending July 1st, 1882, with Additional Records for the Six Months from July 1st, 1882, to January 1st, 1883.

Station, State Agricultural College Farm. Latitude 40° 21′ N.; Longitude 2° 20′ E. Height of Barometer Cistern above Sea Level, 225 feet.

OBSERVER, THEODORE WEST.

	BAROMETER. Reduced to 32 deg.			THERMOMETER.								
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean humidity.	Prevailing wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1882.												
July	......	......	......	91	59	70.7	......	N. E., W. S. W.	[illegible].04	......	......	......
August	......	......	......	98	54	69.5	......	E. S. E., W. S. W.	3.20	......	......	......
September	......	......	......	90	50	64.7	......	E. N. E., W. S. W.	15.53	......	......	......
October	......	......	......	78	41	56.2	......	N. E., W. S. W.	1.43	......	......	......
November	......	......	......	71	16	37.2	......	W.	1.60	......	......	......
December	......	......	......	45	4	27.8	......	W. S. W.	1.91	......	......	......

* Including melted snow.

Rainfall from P. V. Spader, Esq.; kept in city. 1882, Rainfall of summer showed a deficiency. Autumn, warm until November 14th. Storm of September 21st–24th heaviest rainfall on record. October was noted for its warmth and dull weather. November marked by heavy snow-fall on 29th. Frosts kept off until very late—until in November. A noteworthy high percentage of easterly winds in July, August, September and October.

Tables of Climatology as arranged for Comparison with Vital Statistics and with Conditions Affecting Disease.

Station, Newton, N. J. Latitude 41° 2′ 45″ N.; Longitude 2° 19′ 48″ E. Height of Barometer Cistern above Sea Level, 660 feet.

Observer, Miss E. Foster.

	Barometer. Reduced to 32 degrees.			Thermometer.			Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1878.												
July	....	....	....	92.0	64.0	76.03	......	S. W., N.	......	......	11	7
August	....	....	....	88.0	58.0	73.60	......	S. W.	......	......	9	8
September	....	....	....	86.0	42.0	68.16	......	S. E., E.	......	......	8	7
October	....	....	....	78.0	26.0	41.96	......	S. W.	......	......	11	6
November	....	....	....	59.0	28.0	44.15	......	N. W.	......	2	10	13
December	29.742	28.138	29.223	62.0	9.0	26.96	75.11	W., N. W.	4.74	2	16	16
1879.												
January	29.714	28.779	29.278	49.0	5.0	18.18	76.25	S. W., N. W.	2.75	17	7	11
February	29.[illegible]	28.641	29.250	44.0	3.0	22.19	74.11	N. W., N. E.	2.56	8	12	13
March	29.036	28.638	29.361	60.0	9.0	33.18	77.50	N. W., N. E.	3.67	6	11	16
April	....	....	....	80.0	26.0	50.25	......	N. W.	......	8	11	10
May	....	....	....	84.0	45.0	60.66	......	S. W.	......	......	6	6
June	....	....	....	92.0	54.0	73.27	......	S. W.	......	......	9	3
For the Year	29.840	28.549	29.297	72.58	30.75	48.55	75.49	....	13.93	38	121	116

* Including melted snow.

1878, July—Hot, and frequent thunder-showers. August—Very humid. September—Warm and dry. October—Drouth. November—Rains and fogs. December—Cold icy winds; very humid.

1879, January—Hazy and windy. February—Snow on the ground the entire month. March—Very humid. April—Northwest winds. May—Dry, seven frosts. June—Warm and dry.

There were nineteen fogs and thirteen thunder-storms during the year.

Station, Newton, N. J. Latitude 41° 2′ 45″ N.; Longitude 2° 19′ 48″ E. Height of Barometer Cistern above Sea Level, 660 feet.

Observer, Miss E. Foster.

	Barometer. Reduced to 32 degrees.			Thermometer.			Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1879.												
July	....	....	....	96.0	60.0	60.29	......	S. W.	......	......	6	8
August	....	....	....	92.0	56.0	72.18	......	S. W.	......	......	7	7
September	....	....	....	86.0	40.0	63.62	......	S. W.	......	......	6	7
October	....	....	....	84.0	30.0	61.58	......	S.	......	......	3	7
November	....	....	....	76.0	18.0	44.38	......	N. W.	......	5	9	7
December	....	....	....	62.0	10.0	36.29	......	N. E.	......	8	10	14
1880.												
January	....	....	....	60.0	10.0	29.79	......	S. W.	......	4	10	13
February	....	....	....	66.0	5.0	27.78	......	S. W.	......	6	5	11
March	....	....	....	72.0	18.0	36.[illegible]	......	N. W.	......	13	10	15
April	....	....	....	78.0	34.0	61.72	......	N. W.	......	......	7	12
May	....	....	....	92.0	40.0	69.40	......	S. W.	......	......	6	10
June	....	....	....	91.0	58.0	72.90	......	S. W.	......	......	6	5
For the Year	....	....	....	79.58	30.75	53.96	......	....	......	36	83	111

* Including melted snow.

1879, July—Dry and windy. August—Rains from northeast; hot sun; humid. September, October and November—Warm, dry and windy. December—Hazy; frequent mists.

1880, January—Very humid; nine days of fog. February—First part clear and cold; latter, hazy and warm. *March—Very humid.* April—Dry and windy. May and June—Hot and dry.

There were twenty five fogs and five thunder-storms during the year.

METEOROLOGICAL SUMMARY FROM JULY 1st, 1882, TO JANUARY 1st, 1883.

Station, Dennis Library, Newton, N. J. Latitude, 41° 2′ 45′′ N.; Longitude, 2° 19′ 48′′ E. Height of Barometer Cistern above Sea Level, 660 feet.

Observer, Miss E. Foster.

	Barometer Reduced to 32 degrees			Thermometer															
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean humidity.	Prevailing wind.	Rain (inches.)*	Snow (inches.)	Days when precipitation equaled 0.01.	Cloudy days.	Rainfall on days.	Thunder and lightning on days.	Snowfall on days.	Fog.	Hail.	Frost.	Lunar halos.
1882.																			
July	29.576	28.829	29.262	94.7	58.3	74.16	74.41	S. W.	3.40	trace.	8	8	9	2	1	......	......	......	......
August	29.603	28.862	29.234	96.1	50.0	73.06	79.28	S. W.	3.69	....	8	11	10	3	......	8	......	......	......
September	29.533	28.912	29.318	86.0	40.2	66.11	87.0	N. E.	9.26	....	12	19	19	5	......	4	1	......	1
October	29.638	28.981	29.343	74.0	26.0	55.51	88.66	N. E.	3.506	trace.	13	14	15	......	1	12	......	2	5
November	29.760	28.950	29.376	68.3	18.2	39.26	80.41	N. E.	1.20	13.0	4	10	5	......	5	1	1	7	5
December	29.677	28.863	29.212	48.0	6.9	29.19	70.43	N. W.	1.86	3.2	8	15	7	......	9	3	......	4	6
For the half Year	29.638	28.889	29.315	77.83	34.10	56.38	80.03	....	21.096	16.2	53	65	64	10	16	28	2	13	17

* Including melted snow.

Remarks.—July 1882, had a greater range of temperature and a higher humidity than that of 1881; remarkable for the absence of cloudy days and fogs; auroras were frequent; snow fell on the 5th; diphtheria was prevalent near the middle, and sciatica near the latter part, of the month. August had an excess of dews, fogs and mists; from the 1st to the 8th, winds were from points between N. E. and S. S. E., and with an increasing temperature and heavy, oppressive night atmosphere, several cases of diphtheria took a fatal form. September was more equable; all the general rains were accompanied by thunder and lightning; no sickness appeared until after the excessive rainfall of the latter part of the month, then one death from consumption, and neuralgia on the increase. October was misty, foggy and dewy; from the 15th to the 19th dense fogs and heavy atmosphere characterized the nights and days, during that period there was one death from pneumonia, and diphtheria reappeared; rainfall was deficient, though there were 94 hours of precipitation. November, first frost on the 3d; ground frozen on 3d and 4th; one case of malaria; dysentery on 5th; snow covered the ground 10 days in latter half of the month; there was a marked presence of ozone previous to the snowfalls. Autumn, 1882, unusual prevalence of N. E. winds. December was a steadily cold month; mean (sheltered) temperature was nearly 10 degrees below the mean of December, 1881; there were 25 days when the minimum temperature was 32 degrees or less; snow on the ground 16 days; neighborhood unusually free of sickness; a mild case of diphtheria appeared on the 29th.

Station, City Hall, Paterson, N. J. Latitude 40° 55′ N.; Longitude 74° 11′ W.
Height of Rain Gauge above Sea Level, 142 feet.

OBSERVER, JOHN T. HILTON, CITY SURVEYOR.

	Barometer. Reduced to 32 degrees.			Thermometer.			Mean Humidity.	Prevailing Wind.	Rain, (Inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days
	Max.	Min.	Mean.	Max	Min.	Mean.						
1878.												
July									4.01		10	
August									3.88		9	
September									2.45		[illegible]	
October									2.53		7	
November									4.93	1	11	
December									7.80	2	8	
1879.												
January									2.63	16	7	
February				43	9	28			2.82	12.50	10	
March				63	26	39			5.39	4.50	13	
April				70	28	50			3.99		10	
May				84	48	64			3.91		10	
June				95	55	73			3.97		13	
For the Year									47.80	38		

* Including melted snow.

Station, City Hall, Paterson, N. J. Latitude 40° 55′ N.; Longitude 74° 11′ W
Height of Rain Gauge above Sea Level, 142 Feet.

OBSERVER, JOHN T. HILTON, CITY SURVEYOR.

	Barometer. Reduced to 32 degrees.			Thermometer.			Mean Humidity.	Prevailing Wind.	Rain, (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min	Mean.	Max.	Min.	Mean.						
1879.												
July				96	61	76			5.15		11	
August				92	58	71			7.60		9	
September				80	42	63			3.84		5	
October				80	28	60			.32		6	
November				70	17	40			1.15	3.50	7	
December				60	16	34			5.56	7.25	11	
1880.												
January				69	11	36			2.90	8	9	
February				63	6	35			4.18	10.25	12	
March				62	19	37			6.73	14	14	
April				90	30	53			4.31		12	
May				93	33	73			.95		3	
June				97	50	76			3.10		8	
For the Year						52.67			45.38	38		

* Including melted snow

Station, City Hall, Paterson, N. J. Latitude 40° 55′ N.; Longitude 74° 11′ W.
Height of Rain Gauge above Sea Level, 142 Feet.

OBSERVER, JOHN T. HILTON, CITY SURVEYOR.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.								
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1880.												
July				93	61	79			12.06		12	
August				93	52	74			6.92		10	
September				93	48	66			3.36		6	
October				69	33	55			5.57		9	
November				67	9	40			5.60	3.50	10	
December				47	—6	34			2.41	14	[illegible]	
1881.												
January				44	—3	25			7.33	18.25	8	
February				57	—5	26			6.95	10.25	11	
March				84	24	36			16.11	1.50	9	
April				82	24	46			1.74		4	
May				87	35	63			3.69		11	
June				96	49	66			11.74		14	
For the Year						50.31			88.48	48		

* Including melted snow.

Station, City Hall, Paterson, N. J. Latitude 40° 55′ N.; Longitude 74° 11′ W.
Height of Rain Gauge above Sea Level, 142 Feet.

OBSERVER, JOHN T. HILTON, CITY SURVEYOR.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.								
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1881.												
July				92	66	74			2.48		7	
August				96	60	77			1.13		7	
September				96	56	73			1.46		9	
October				84	31	57			2.76		9	
November				68	[illegible]	45			4.86	1	11	
December				57	16	37			7.87	[illegible]	15	
1882.												
January				51	—5	30			4.59	24.75	14	
February				53	16	35			5.39	12	11	
March				24	6	38			5.80	.75	10	
April				73	30	[illegible]			3.39		11	
May				55	35	56			13.46		16	
June				95	56	66			8.50		10	
For the Year							53		62.69	38.75		

* Including melted snow.

Station, Newark, N. J. Latitude 40° 21′ N.; Longitude 2° 20′ E. Height of Barometer Cistern above Sea Level, 225 feet.

OBSERVER, W. A. WHITEHEAD.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.								
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01	Cloudy days.
1878.												
July	30.15	29.7	29.9	98.25	61.5	78.25	......	N. W., S.	4.8	......	12	10
August	30.19	29.73	29.96	90.5	66	73.69	......	N. W., S. W.	8.05	......	10	10
September	30.53	29.86	30.18	88	43.75	67.46	......	N. E., S. E.	[illegible]	......	10	12
October	30.40	29.62	30.01	78.75	35	58.40	......	N. W., S. W.	2.92	......	8	6
November	30.68	29.62	29.61	58	27	42.66	......	N. W., S. W.	4.57	......	9	9
December	30.50	29.65	29.68	57.75	13.5	31.82	......	N. W., W.	4.68	......	7	6
1879.												
January	30.52	29.36	29.94	46.75	—2	25.68	......	N. W., S. W.	2.89	......	11	6
February	30.78	29.45	30.11	49.75	10.5	27.68	......	N. W., S. W.	2.53	......	16	12
March	30.7	29.47	30.04	65	16.5	38.42	......	N. W., S. W.	3.75	......	17	10
April	30.4	29.43	29.91	76.25	24.5	67.96	......	N. W., S. W.	4.76	......	10	6
May	30.53	29.8	30.16	85.75	37.75	63.53	......	N. W., S. W.	2.175	......	6	6
June	30.3	29.22	29.75	94	48	71.58	......	S. W., W.	3.04	......	12	5
For the Year	......	......	......	......	......	......	......	......	......	......	......	......

*Including melted snow.
1878.—Snow on six days, 4.25 inches.
1879, January—Snow on eight days, 17.75 inches, and rain together, 2.89. February—Thirteen days of snow, 13 inches, and rain together, 2.53. March—Four days of snow, 1.25 inches, and rain together, 3.75. April—Snow on five days and rain together, 4.76.

Station, Newark, N. J. Latitude 40° 21′ N.; Longitude 2° 20′ E. Height of Barometer Cistern above Sea Level, 225 feet.

OBSERVER, W. A. WHITEHEAD.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.								
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1879.												
July	30.3	29.72	30.01	99.25	58	75.36	......	N. W., S. W.	5.06	......	8	7
August	30.2	29.85	29.72	90	54	71.78	......	W., S. W.	9.12	......	8	9
September	30.4	29.86	30.12	93.75	38.75	62.45	......	S. W., W.	3.75	......	6	9
October	30.7	29.50	30.10	82	26.5	50.60	......	S. W., N. W.	.82	......	3	4
November	30.5	29.60	30	71	17	41.76	......	W., N. W.	1.94	......	7	20
December	30.7	29.7	30.304	59	11.5	35	......	S. W., N. W.	6.83	......	11	10
1880.												
January	30.67	29.71	30.24	60	13.5	37.64	......	E., N. W.	2.59	......	7	8
February	30.56	29.612	30.158	62.75	8	35.059	......	N. W., S. W.	2.63	......	7	6
March	30.55	29.61	30.127	67	16.5	37.45	......	N. W., S. W.	4.9	......	13	8
April	30.4	29.58	30.07	89	36.25	51.75	......	N. W., S. W.	3.80	......	12	[illegible]
May	30.3	29.71	30.07	96	35	68.3	......	S. W., N. W.	.76	......	6	2
June	30.32	29.68	30.07	94.25	49.25	73.69	......	S. W., N. W.	1.18	......	7	5
For the Year	......	......	......	......	......	......	......	......	......	......	......	......

*Including melted snow.
1879, December—Snow on seven days to 7.5 inches.
1880, January had only one measurable snow, 2 inches. February—One day of snow to 6 inches. March—On four days to 10 inches.

Station, City Hall, Paterson, N. J. Latitude 40° 55′ N.; Longitude 74° 11′ W.
Height of Rain Gauge above Sea Level, 142 Feet.

OBSERVER, JOHN T. HILTON, CITY SURVEYOR.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean						
1880.												
July	....	....	....	93	61	79	......	....	12.06	......	13	....
August	....	....	....	[illegible]	52	74	......	....	6.93	......	10	....
September	....	....	....	[illegible]	48	65	......	....	8.86	......	6	....
October	....	....	....	69	33	53	......	....	5.57	......	9	....
November	....	....	....	67	9	40	......	....	5.60	3.50	10	....
December	....	....	....	47	—6	34	......	....	2.41	14	9	....
1881.												
January	....	....	....	44	—8	25	......	....	7.83	18.25	8	....
February	....	....	....	67	—5	[illegible]	......	....	6.96	10.25	11	....
March	....	....	....	84	24	[illegible]	......	....	16.11	1.50	9	....
April	....	....	....	83	24	46	......	....	1.74	......	4	....
May	....	....	....	87	35	64	......	....	3.69	......	11	....
June	....	....	....	86	49	66	......	....	11.74	......	14	....
For the Year	....	....	....	.....	......	50.31	......	....	83.46	48	......	....

* Including melted snow.

Station, City Hall, Paterson, N. J. Latitude 40° 55′ N.; Longitude 74° 11′ W.
Height of Rain Gauge above Sea Level, 142 Feet.

OBSERVER, JOHN T. HILTON, CITY SURVEYOR.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1881.												
July	....	....	....	93	66	74	......	....	2.46	......	7	....
August	....	....	....	96	60	77	......	....	1.18	......	7	....
September	....	....	....	94	56	73	......	....	1.46	......	9	....
October	....	....	....	84	31	57	......	....	2.76	......	9	....
November	....	....	....	68	24	45	......	....	4.56	1	11	....
December	....	....	....	57	16	37	......	....	7.87	.25	15	....
1882.												
January	....	....	....	61	—5	30	......	....	4.50	24.75	14	....
February	....	....	....	53	16	33	......	....	5.39	13	11	....
March	....	....	....	94	6	[illegible]	......	....	[illegible]	.75*	10	....
April	....	....	....	72	20	46	......	....	3.39	......	11	....
May	....	....	....	86	35	56	......	....	13.48	......	16	....
June	....	....	....	96	36	68	......	....	[illegible]	......	10	....
For the Year	....	....	....	.....	......	.....	83	....	62.60	38.75	......	....

* Including melted snow.

Station, Agricultural College Farm, New Brunswick, N. J. Latitude, 40° 29′ N.; Longitude, 74° 26′ W. or 2° 37′ E. Height, 115 feet.

OBSERVER, THEODORE WEST.

	Barometer. Reduced to 32 degrees.			Thermometer.			Mean Humidity.	Prevailing Wind.	Rain (Inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1878.												
July				93	63	75.2		S. W.	5.13			
August				87	64	70.9		W. S. W.	2.69			
September				86	42	65.2		E. N. E.	3.23			
October				78	35	56.1		W. S. W.	3.15			
November				59	23	41.9		W. N. W.	2.99			
December				60	13	31.4		W. N. W.	4.95			
1879.												
January				45	−8	23.6		W. S. W.	1.58			
February				56	8	25.7		W. N. W.	1.60			
March				66	20	36.6		W. N. W.	4.27			
April				70	27	45.1		W. N. W.	2.71			
May				93	41	61.5		W. S. W.	3.84			
June				95	50	68.3		W. S. W.	4.56			
For the Year				95	−8	60.1			39.83			

* Including melted snow.

1878—Summer warmer than average. July—Very hot month. Rainfall below mean. Autumn moderately warm and rains well distributed. September—Marked by easterly winds.

1878-9—Winter one of the coldest recorded. Steady cold weather, but no very low depressions in temperature. Deficiency in rainfall.

1879—Spring marked by great changes of temperature. Moderate rains throughout the season.

Station, Agricultural College Farm, New Brunswick, N. J. Latitude, 40° 29′ N.; Longitude, 74° 26′ W., or 2° 37′ E. Height, 115 feet.

OBSERVER, THEODORE WEST.

	Barometer. Reduced to 32 degrees.			Thermometer.			Mean Humidity.	Prevailing Wind.	Rain (Inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1879.												
July				98	60	73.2		W. S. W.	1.90			
August				91	56	70.6		W. S. W.	7.96			
September				86	43	63.3		W. S. W.	1.60			
October				84	29	56.9		W. S. W.	†			
November				72	14	41.1		W. S. W., S.	1.78			
December				60	9	36.6		W. S. W.	4.14			
1880.												
January				61	5	36.6		W. S. W.	1.99			
February				67	8	34		W. S. W.	1.46			
March				72	19	35.8		N. N. W.	4.80			
April				81	30	47.9		W. S. W.	1.56			
May				98	37	66.2		S. W.	.66			
June				97	49	71.9		W. S. W.	1.47			
For the Year				97	5	53.8			29.83			

* Including melted snow.

† .08 inches at Spader's house, New Brunswick.

1879—Summer, excepting July, average temperature. July—Marked by high maximum and slight rains. August—Large rainfall and rather cool.

Autumn dry and warm. September 7th to November 18th only very light and infrequent rains. A prevalence of southerly winds in November.

1879-80—Winter warmest recorded here. No extremely low temperature. Rainfall much below mean amount. No sleighing snows. No sudden changes. Winds, W. S. W. and N. E., former prevailing.

1880—Spring very dry. Drought in May, but one rain (30th), and month with extremely high temperature.

Station, Newark, N. J. Latitude 40° 21′ N.; Longitude 2° 20′ E. Height of Barometer Cistern above Sea Level, 225 feet.

OBSERVER, W. A. WHITEHEAD.

	Barometer Reduced to 32 degrees. Max.	Min.	Mean.	Thermometer. Max.	Min.	Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1880.												
July	30.26	29.75	30.03	93	56.5	75.31	......	W., S. W.	7.46	......	14	5
August	30.44	29.76	30.09	96	50.75	72.25	......	S., S. W.	4.68	......	11	10
September	30.35	29.7	30.04	95	47.75	65.95	......	N. W., S. W.	3.46	......	6	6
October	30.57	29.54	30.09	76	31.75	52.7	......	N. W., S. W.	2.1	......	8	5
November	30.76	29.7	30.27	65	14.25	38.43	......	N. W., S. W.	3.26	......	6	6
December	30.5	29.6	30.09	44	-5	26.89	......	W., N. W.	2.62	......	9	10
1881.												
January	30.66	29.4	30.17	40.25	–5	24.44	......	W., N. W.	5.06	......	6	9
February	30.56	29.45	30.24	51.25	–3	27.91	......	W., N. W.	4.64	......	9	5
March	30.38	29.17	29.83	57	21.75	37.27	......	W., S. W.	6.83	......	11	9
April	30.31	29.6	29.94	80.75	22	[illegible]	......	N. W., S. W.	1.79	......	5	8
May	30.46	29.51	30.08	92.5	38	64.11	......	N. E., S. E.	2.91	......	13	6
June	30.2	29.65	29.42	90	49.5	66.75	......	N. E., S. E.	5.04	......	17	15
For the Year	....	....	....	....	....	....	....	....	....	....	....	....

*Including melted snow.
1880.—November had two days of snow, 3 inches.

Station, Newark, N. J. Latitude 40° 21′ N.; Longitude 2° 20′ E. Height of Barometer Cistern above Sea Level, 225 feet.

OBSERVER, W. A. WHITEHEAD.

	Barometer Reduced to 32 degrees. Max.	Min.	Mean.	Thermometer. Max.	Min.	Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1881.												
July	30.25	29.66	29.44	93	59.25	75.07	......	N. W., S. W.	1.84	......	7	11
August	30.53	29.66	30.03	96	56.5	75.64	......	E., W.	0.28	......	5	2
September	30.35	29.9	30.15	100.5	50.75	73.72	......	N. E., S. E.	0.87	......	7	6
October	30.59	29.62	30.14	83	33.75	57.93	......	N. W., S. W.	2.73	......	17	5
November	30.65	29.63	30.19	68.71	22.25	44.10	......	N. W., S. W.	3.07	......	16	7
December	30.63	29.4	30.19	66.5	19.25	39	......	N. W., S. W.	4.53	......	10	8
1882.												
January	30.8	29.26	30.18	48	8	29.6	......	N., N. W., W.	5.80	......	10	8
February	30.75	29.54	30.19	63.5	11.75	33.61	......	S. W., N. W.	4.73	......	9	7
March	30.69	29.55	30.14	60.5	17.75	40.13	......	N. W., S. W.	3.19	......	10	4
April	30.46	29.55	30.08	72.5	26	46.94	......	N. W., S. W.	2.01	......	10	6
May	30.45	29.54	30.05	83.25	24	55.23	......	N. E., S. E.	5.69	......	12	5
June	30.27	29.5	30.04	95	49.5	73.78	......	N. W., W.	3.09	......	6	7
For the Year	....	....	....	....	....	....	....	....	....	....	....	....

*Including melted snow.

Station, Freehold, N. J. Latitude 40° 15′ N.; Longitude 74° 16′ W. Height of Barometer Cistern above Sea Level, 216 feet.

OBSERVER, CHAS. F. RICHARDSON.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.	Thunder and Lightning on days.
	Max.	Min.	Mean.	Max.	Min.	Mean.							
1878.													
July	29.94	29.40	29.72	95	69.5	75.60	77.5	W.	5.68	......	12	6	8
August	29.91	29.41	29.66	86	53.5	71.30	88.2	W.	5.72	......	16	7	8
September	30.19	29.46	29.87	85	43.5	66.65	82.6	W.	3.03	......	13	10	5
October	30.05	29.23	29.76	76	33.5	55.41	74.9	N. W.	2.30	......	9	5	2
November	30.25	28.78	29.71	59	25.4	42	78.6	W.	3.18	......	14	7	1
December	30.31	29.57	29.72	59	12	31.11	75.5	W.	6.61	3.97	16	4	1
1879.													
January	30.22	29.20	29.76	49	—3	25.58	74	W.	2.60	13.5	12	7	....
February	30.47	29.18	29.78	54	8	26 77	72.8	W.	3.12	8.7	19	8	....
March	30.40	29.07	29.83	65	17	38.01	77.7	W.	3.55	.5	22	8	3
April	30.09	29.12	29.65	72	23	46.42	74.9	W.	4.47	.4	14	13	3
May	30.12	29.48	29.81	92	36	61.90	76	S.	2.48	......	9	5	6
June	30.01	29.26	29.71	94	46	70.13	77.7	W.	4.73	......	13	4	11
For the Year	....	....	29.74	......	......	50.74	77	....	48.48	27.07	157	84	48

* Including melted snow.
1879, June—3 frosts. May—6 frosts. April—8 frosts.

Station, Freehold, N. J. Latitude 40° 15′ N.; Longitude 74° 16′ W. Height of Barometer Cistern above Sea Level, 216 feet.

OBSERVER, CHAS. F. RICHARDSON.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.	Thunder and Lightning on days.
	Max.	Min.	Mean.	Max.	Min.	Mean.							
1879.													
July	30.01	29.31	29.72	97	56	75.8	78.3	W.	5.45	......	10	6	10
August	29.90	29.44	29.70	98	51	70.8	83.4	W.	9.58	......	10	10	5
September	30.17	29.53	29.89	85	37	61.4	80.5	W.	1.86	......	8	2	6
October	30.50	29.33	29.92	83	26	58.5	79.6	W.	.68	......	9	3	2
November	30.31	29.26	29.91	72	16	41.5	74.2	W.	1.71	1.86	7	7	1
December	30.41	29.53	29.97	60	8	36.7	80.3	N. W.	6.77	4.75	12	14	
1880.													
January	30.45	29.64	30	59	11	28.2	81.4	W.	2.06	4	11	8	1
February	30.37	29.24	29.95	67	9	34.8	76.1	W.	2.69	9.70	11	7	....
March	30.23	29.41	29.92	69	16	36.9	74.2	N. W.	5.71	15.40	16	11	....
April	30.11	29.60	29.84	82	23	49.7	67.5	N. W.	2.91	......	12	8	7
May	30.05	29.57	29.82	95	33	68	69.2	W.	.83	......	6	4	5
June	30	29.47	29.76	94	49	72	71.6	W.	1.58	......	7	4	8
For the Year	....	....	29.88	......	......	53.5	76.3	....	41.84	35.70	119	84	45

* Including melted snow.
1879, September—2 frosts. October—4 frosts. November—17 frosts. 1880, April—6 frosts. May—3 frosts.

Station, Freehold, N. J. Latitude 40° 15′ N.; Longitude 74° 16′ W. Height of Barometer Cistern above Sea Level, 216 feet.

OBSERVER, CHAS. F. RICHARDSON.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.	Thunder and Lightning on days.
	Max.	Min.	Mean.	Max.	Min.	Mean.							
1880.													
July	29.91	29.58	29.75	90	54	71.9	78.7	N. W.	3.57	......	15	5	13
August	30.14	29.32	29.82	89	50	74.3	81	S.	4.17	......	9	9	9
September	30.17	29.48	29.84	88	46	65.2	79.6	W.	2.87	......	6	4	3
October	30.15	29.31	29.58	79	31	51.1	77	N. W.	2.61	......	11	6	1
November	30.45	29.49	30	65	9	37	72.6	W.	3.44	4.3	10	7	1
December	30.19	29.42	29.79	49	—11	25.5	73.2	N. W.	6.56	51.2	13	10	....
1881.													
January	30.36	29.19	29.91	41	—7	23.5	75.3	W.	7.86	9.8	12	10	....
February	30.58	29.25	29.96	53	—6	27.3	80.1	N. W.	6.23	11.4	12	10	1
March	30.12	28.97	29.55	59	21	36.3	75.6	N. W.	7.14	3	11	13	1
April	30.09	29.27	29.67	76	21	44.9	70.6	W. N. W.	1.07	......	5	8	1
May	30.21	29.48	29.82	91	35	60.1	80.7	S. E.	2.78	......	13	9	7
June	29.93	29.44	29.79	90	47	64.5	81.3	W. N. W.	7.78	......	16	9	9
For the Year	....	....	29.81	......	......	48.5	77.1	....	61.49	79.7	132	100	46

* Including melted snow.
1880, October—11 frosts. November—19 frosts.

Station, Freehold, N. J. Latitude 40° 15′ N.; Longitude 74° 16′ W. Height of Barometer Cistern above Sea Level, 216 feet.

OBSERVER, CHAS. F. RICHARDSON.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.	Thunder and Lightning on days.
	Max.	Min.	Mean.	Max.	Min.	Mean.							
1881.													
July	30	29.42	29.71	90.2	56	73.5	75.7	W.	.70	......	7	4	6
August	30.08	29.44	29.79	96	54	72.1	78.7	S. W.	3.13	......	7	4	3
September	30.13	29.64	29.86	102	46	71.5	80.6	S. S. W.	2.65	......	8	9	6
October	30.29	29.29	29.90	85	30	57.5	79.8	W.	3.45	......	12	9	3
November	30.39	29.42	29.93	69	20	44.4	79	W.	3.55	......	12	11	....
December	30.31	29.23	29.89	68	17	33.8	83.4	W.	3.87	25	16	13	....
1882.													
January	30.51	29.14	29.94	48	—3	29.2	75.2	W.	5.42	8.44	19	13	....
February	30.43	29.24	29.69	56	17	33.7	75.8	W. N. W.	5.17	14.5	13	8	1
March	30.33	29.34	29.87	61	16	30.5	70.9	N. W.	2.82	2.5	12	9	1
April	30.28	29.24	29.83	75	24.5	45.6	68.5	W.	2.40	.3	13	9	3
May	30.19	29.28	29.81	82	30	58.8	75.1	W.	4.51	......	13	10	1
June	30.09	29.38	29.70	94	46.5	69.5	70	S. W.	3.44	......	11	1	3
For the Year	....	....	29.84	......	......	51.7	75.9	....	41.11	50.74	144	100	37

* Including melted snow.
1881, October—3 frosts. November—13 frosts. 1882, March—18 frosts. April—7 frosts. May—2 frosts.

Station, Vineland, N. J. Latitude 39° 39′ N.; Longitude 75° .01′ E. Height of Barometer Cistern above Sea Level, 111 feet.

OBSERVER, J. INGRAM, M. D.

	Barometer. Reduced to 32 degrees. Max.	Barometer. Min.	Barometer. Mean.	Thermometer. Max.	Thermometer. Min.	Thermometer. Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.
1878.											
July	29.96	29.48	29.79	96	66	77.9	80	S. W., S. E.	[illegible]	......	8
August	30.02	29.55	29.78	92	57	73.3	82	S. W., N. E.	8.46	......	10
September	30.29	29.52	29.99	86	42	68	80	S. W., N. E.	.69	......	5
October	30.14	29.02	29.89	78	32	56.2	76	S. W., N. W.	2.18	......	7
November	30.82	26.82	29.81	61	23	42.9	79	N. W., S. W.	2.85	......	7
December	30.31	[illegible]	[illegible]	60	9	31.7	67	N. W., S. W.	5.69	1.75	9
1879.											
January	30.86	29.29	29.90	68	−4	28.9	66	S. W., N. W.	3.75	5	6
February	30.60	29.31	29.89	58	7	29.6	71	N. W., S. W.	2.88	5.75	6
March	31.51	29.29	29.96	68	18	41	82	N. E., S. W.	3.36	......	10
April	30.34	29.30	29.76	88	30	48.3	80	N. W., S. W.	3.47	......	9
May	30.29	29.67	29.91	92	46	63.4	74	S. W., N. W.	.77	......	4
June	30.09	29.36	29.58	94	44	75.3	78	S. W., N. W.	4.91	......	9
For the Year	30.26	29.27	29.89	77	−8	52.9	76	....	45.1	11.50	90

*Including melted snow.

Station, Vineland, N. J. Latitude 39° 39′ N.; Longitude 75° .01′ E. Height of Barometer Cistern above Sea Level, 111 feet.

OBSERVER, J. INGRAM, M. D.

	Barometer. Reduced to 32 degrees. Max.	Barometer. Min.	Barometer. Mean.	Thermometer. Max.	Thermometer. Min.	Thermometer. Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.
1879.											
July	30.10	29.40	29.82	97	46	75.8	73	S. W., S.	3.04	......	7
August	30.06	29.53	29.79	94	49	72.2	77	S. W., N. E.	10.6	......	10
September	30.29	29.63	29.98	91	38	65.5	75	N. W., S. W.	3.4	......	7
October	30.59	29.38	29.99	92	28	63.8	76	S. W., N. W.	1.10	......	7
November	30.41	29.38	29.96	60	18	49.1	74	N. W., S. W.	2.80	4.50	7
December	30.45	29.54	30.01	70	19	41.7	72	S. W., N. W.	6.27	15	12
1880.											
January	30.45	29.52	30.04	61	10	41.3	71	N. W., S W.	2.62	5	12
February	30.39	29.01	29.97	69	19	29.1	60	S. W., N. W.	3.36	1.75	7
March	30.31	29.14	29.86	74	20	40.9	69	N. W, N. E.	6.85	......	13
April	30.16	29.41	29.81	82	22	53.1	65	N. W., S. W.	2.61	......	12
May	30.09	29.61	29.87	96	34	69.2	63	N. W., S. E.	2	......	5
June	30.11	29.53	29.84	97	52	74.7	69	S. W., N. W.	3.06	......	6
For the Year	....	....	29.91	......	......	56.07	73	....	47	26.25	105

*Including melted snow.

Station, Vineland, N. J. Latitnde 39° 29′ N.; Longitude 75° .01′ E. Height of Barometer Cistern above Sea Level, 111 feet.

OBSERVER, J. INGRAM, M. D.

	Barometer. Reduced to 32 degrees. Max.	Min.	Mean.	Thermometer. Max.	Min.	Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1880.												
July	30.02	29.56	29.84	98	56	76.45	78	S. W., N. W.	3.64	......	8	....
August	30.23	29.59	[illegible]	90	50	73.02	77	S. W., N. E.	5.64	......	8	....
September	30.16	29.59	29.90	92	44	66.83	80	S. W., N. W.	2.94	......	5	....
October	30.27	29.42	29.97	86	30	54.11	71	N. W., N. E.	3.75	......	9	....
November	30.60	29.50	30.06	67	8	[illegible]	68	S. W., N. W.	4.44	4.50	9	....
December	30.83	29.53	29.91	60	—10	[illegible]	65	N. W., S. W.	7.55	30	10	....
1881.												
January	30.49	29.16	[illegible]	48	—10½	25.21	61	N. W., S. W.	6.81	9.80	10	....
February	30.60	29.81	[illegible]	58	—6	29.96	61	N. W., S. W.	5.61	14	9	....
March	30.07	[illegible]	29.58	62	23	36.56	75	N. W., S. W.	5.25	......	9	....
April	30.07	29.81	29.75	83	26	37.36	69	S. W., N. W.	1.30	......	8	....
May	30.25	29.40	29.75	94	44	64.36	73	S. W., N. E.	3.60	......	10	....
June	29.98	29.62	29.74	94	54	69.74	79	S. W., N. W.	4.67	......	11	....
For the Year	....	....	29.84	......	......	50.56	70	....	59.99	67	102	....

*Including melted snow.

Station, Vineland, N. J. Latitude 39° 29′ N.; Longitude 75° .01′ E. Height of Barometer Cistern above Sea Level, 111 feet.

OBSERVER, J. INGRAM, M. D.

	Barometer. Reduced to 32 degrees. Max.	Min.	Mean.	Thermometer. Max.	Min.	Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1881.												
July	30.04	29.53	29.78	97	60	77.90	65	S. W., N. W.	2.96	......	6	....
August	30.17	29.54	29.90	100	55	76.44	62	S. W., N.	.66	......	4	....
September	30.16	29.71	29.94	104	56	76.76	63	S. W., N. W.	2.35	......	4	....
October	30.37	29.47	30.03	89	40	61.72	61	S. W., N. W.	3.12	......	8	....
November	30.54	29.50	30.07	75	24	45.66	68	N. W., S. W.	2.05	......	9	....
December	30.46	29.56	30.06	66	12	41.90	62	S. W., N. W.	5.04	......	10	....
1882.												
January	30.67	29.06	30.06	62	......	34.63	65	N. W., S. W.	6.45	11	15	....
February	30.66	29.33	30.02	60	18	36.06	66	N. W., S. W.	5.41	12	8	....
March	30.61	29.49	29.97	62	21	41.46	61	N. W., S. W.	4.11	8	12	....
April	30.55	29.81	29.81	80	26	46.26	60	S. W.	2.19	......	9	....
May	30.27	29.57	29.86	86	32	55.70	78	S. W., N. E.	5.49	......	10	....
June	30.06	29.46	29.79	96	60	71.66	67	S. W., N. W.	1.86	......	4	....
For the Year	....	....	29.94	......	......	56.17	......	....	40.59	26	99	....

*Including melted snow.

Station, Middletown, N. J. Latitude ° ′ N.; Longitude ° ′ E. Height of Barometer Cistern above Sea Level, feet.

OBSERVER, FRANK OSBORN.

	BAROMETER. Reduced to 32 degrees. Max.	Min.	Mean.	THERMOMETER. Max.	Min.	Mean.	Mean Humidity.	Prevailing Wind.	Rain (Inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1879.												
July	....	....	....	96	65	73.23	......	....	......	......	......	....
August	....	....	....	92	53	71.09	......	....	......	......	......	....
September	....	....	....	88	42	64.15	......	....	......	......	......	....
October	....	....	....	93	27	61.56	......	....	......	......	......	....
November	....	....	....	78	18	44.31	......	....	......	......	......	....
December	....	....	....	78	6	37.56	......	....	......	......	......	....
1880.												
January	....	....	....	69	12	40.64	......	....	......	......	......	....
February	....	....	....	75	7	35.57	......	....	......	......	......	....
March	....	....	....	71	13	37.91	......	....	......	......	......	....
April	....	....	....	86	23	[illegible]	......	....	......	......	......	....
May	....	....	....	99	31	67.16	......	....	......	......	......	....
June	....	....	....	97	48	72.33	......	....	......	......	......	....
For the Year	....	....	....	......	......	......	......	....	......	......	......	....

* Including melted snow.

Station, Middletown, N. J. Latitude ° ′ N.; Longitude ° ′ E. Height of Barometer Cistern above Sea Level, feet.

OBSERVER, FRANK OSBORN.

	BAROMETER. Reduced to 32 degrees. Max.	Min.	Mean.	THERMOMETER. Max.	Min.	Mean.	Mean Humidity	Prevailing Wind	Rain (Inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1880.												
July	....	....	....	93	56	74.98	......	....	......	......	......	....
August	....	....	....	93	53	72.67	......	....	......	......	......	....
September	....	....	....	96	48	65.31	......	....	......	......	......	....
October	....	....	....	81	30	56.12	......	....	......	......	......	....
November	....	....	....	65	9	36.10	......	....	......	......	......	....
December	....	....	....	61	−11	27.87	......	....	......	......	......	....
1881.												
January	....	....	....	50	−3	26.09	......	....	......	......	......	....
February	....	....	....	64	−6	28.44	......	....	......	......	......	....
March	....	....	....	62	18	37.21	......	....	......	......	......	....
April	....	....	....	83	17	46.96	......	....	......	......	......	....
May	....	....	....	96	29	61.17	......	....	......	......	......	....
June	....	....	....	58	41	64.54	......	....	......	......	......	....
For the Year	....	....	....	......	......	......	......	....	......	......	......	....

* Including melted snow.

Station, Middletown, N. J. Latitude ° ′ N.; Longitude ° ′ E. Height of Barometer Cistern above Sea Level, feet.

OBSERVER, FRANK OSBORN.

	BAROMETER. Reduced to 32 degrees. Max.	Min.	Mean.	THERMOMETER. Max.	Min.	Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1861.												
July				91	58	72.79						
August				90	65	74						
September				107	52	73.66						
October				89	38	59.22						
November				73	20	46.30						
December				70	—5	39.96						
1862.												
January				58	—5	28.56						
February				69	14	25.92						
March				70	15	41.94						
April				76	23	46.63						
May				79	39	55.14						
June				98	47	68.76						
For the Year												

* Including melted snow.

The full tables for Barnegat, Cape May and Sandy Hook, for five years, will be in the next report.

SYNOPSIS OF VITAL RETURNS.

The records of the statistical year ending July 1st, 1882, as given in the tables accompanying this report, show an aggregate of 59,287 returns, of which 8837 are marriages, 23,108 births, and 25,942 deaths. For the former year the returns were 8109 marriages, 23,484 births, and 20,812 deaths. The record is subject to some variations from supplementary returns too late for the annual record. Still births are included in the total, but not included in the returns of death. These for last year were 1476, and 1400 for 1881–2.

It will be seen that the chief variation is caused by an increase in the number of deaths. As next year will complete a quinquennial period, we shall reserve more extended tables and analyses of all returns for five years for the next report, and confine our chief present attention to an inquiry into the causes of this great increase in the returns of deaths, and our examination of the localities which are chiefly responsible for this aggregate. An increase of over 5000 deaths in a single year, may well attract our attention to an inquiry into the significance of the various influences which have aided to make this increase, and especially into such as admit of limitation.

Some consideration must undoubtedly be given to those climatic influences which do not admit of alteration, but as to which we need to learn the laws of adjustment and so practically protect ourselves from the disturbing or critical effects.

The summer of 1881, to which the first part of the record relates, had been preceded by a winter of remarkable length and of severe and steady cold. Such a winter is always depressing to such aged persons as are not in good health, and to that large class of children who suffer from inadequate provision in food, clothing or shelter. A comparison of the deaths from acute lung diseases and from consumption shows an increased record over both of the two preceeding years, which was quite evenly distributed through the various counties. This severe winter continued until late in the spring, was succeeded by the high temperature and severe drought of the summer

of 1881. The drought so continued until October as to make scarcity of water almost to the time of winter freezing. The effect of this prolonged heat and dryness is not slow to make its record in diarrheal or intestinal diseases and fevers and especially upon the younger population. If this were the whole of the story, we would need only to record the accident, and, as not having control of the weather, submit to it, with grief over an unalterable dispensation. But when we see how different are the effects of these climatic conditions on different townships and counties, on rural districts as compared with cities, and on different populations, and, as we know from other sources, on different parts of the same city, we find that disease and death derive their ratios to life not so much from these changes as they do from that local pollution which poisons an arrow otherwise not deadly, and from that artificial susceptibility which makes many a life a plant that withers in the sunshine which gives growth and vigor to the same species living on a proper soil. Thus if we look at this increase of over 5000 deaths, we at once perceive that 1357 of the increase was in Hudson county and 1258 in Essex county, making in these two counties about half of the total increase, their population being about one-third of that of the whole State.

Hudson county is so much a county of cities that the county death-rate represents a close population. In Jersey City especially the death-rate among children has been very high. Nine hundred and eight children died under one year of age, being an increase of 220 over the former year. Between one and five years there was an increase of 251. It is scarcely necessary to emphasize the insanitary condition of much of Hudson county, but when able to compare its cities and those townships which either contain the dependent or criminal population of the city or have special nuisances, with the two or three more rural townships, it is easy to see that the death rate is owing to artificial causes. The appended analysis by C. J. Rooney, Jr., the efficient Registrar of the county Board, is not only a valuable local outline, but a warning to those portions of the State that have not yet allowed sanitary problems to become too complicated for ready solution.

LETTER OF C. J. ROONEY, JR.

"DEAR SIR—In accordance with your request, I beg leave to present the following brief report of the vital statistics of Hudson county during the year July 1st, 1881, to June 30th, 1882.

"During the above-mentioned period Hudson county suffered the high death rate of 29.5 to 30 per 1000 persons living; the rate varying somewhat according to different estimates of the present population.

"The total deaths were 5862; and the greatest number prior to this report was 5233, in 1881, and before that, 4513, in 1876.

"Assuming the lower rate (29.5) to be correct, it is an unusually high one for this county; the highest, in fact, experienced since the records were begun in 1874.

"The average rate for the seven years ending December 31st, 1881, (records of Hudson county Board of Health,) was 23.9. Thus, it may be seen that the rate for the year ending June 30th, 1882, was 5.6 per 1000 above the average for seven years. The mortality of the year 1881 approached nearest to this, the rate being 27 per 1000; and, previous to that, the rate of the year 1876, 26.8, was highest.

"The death rates from 1874 to 1881 inclusive, have varied from 20.9 to 27. This will help to a comprehension of the meaning of the present rate.

"The larger part of the increase of the rate took place in the latter half of the year, January to July, 1882; that is to say, the rate of each month from January to July, 1882, as compared with the same months of previous years, showed a greater increase above the average than the months from July to December, 1881, did above the average for the same period of former years. Each month sustained a rate above the average for the same month for five preceding years of from 3.5 to 9.6 per 1000, the greatest increase being in January 1882, and the next greatest in December, 1881. July, 1881, and January, 1882, with rates of 36 and 33.8, making these respectively the most lethal months of the period.

"The greater part of the increase of mortality took place among persons over five years old. The rate for children under five years old was 13.7; that of persons over five years of age was 15.8.

"According to Hudson county Health Board records, the average for children under five for seven years ending December, 1881, was 11.7; hence, that of the period at present under consideration was 2 per 1000 above the average for this class of decedents.

"According to the same authority, the average rate of death of persons over five years old for seven years ending 1881, was 12.1; so that this year's rate for this class of deaths was 3.7 above the average.

"Upon examining into the causes of the increased mortality, the following named diseases are found to have been the chief factors:

Consumption, small-pox, pneumonia, croup, scarlet fever, diphtheria typhoid and typho-malarial fevers, measles, bronchitis and meningitis. Of these, small-pox, consumption, pneumonia and bronchitis were most notable.

"The rate of death from consumption was 3.3 per 1000, as compared with a seven-year average of 2.6. It was most prominent in October, 1881, January, March and May, 1882.

"Pneumonia, in January, March, April, May and June, 1882, showed the greatest increase when compared with the same disease in the same months of other years.

"Scarlet fever, from December, 1881, to June, 1882, and typhoid fevers, in October, November, December, 1881, March and April, 1882, were most fatal when contrasted with other years.

"If I may anticipate next year's report, I will say that since July, 1882, to time of present writing (December 1st, 1882,) there have not been any deaths from small-pox and no cases are known, none having been reported for some months. The system of general and school vaccination carried on by this Board, assisted by a corps of physicians who generously gave their services to the county without charge, seems to have checked and exterminated the disease.

"The number of births reported was 3207, of marriages, 1504, and of still births, 311. This is a poor showing for the promptness and fidelity of the physicians in complying with the requirements of law as to reporting births.

"The clergymen and justices have done better than ever before.

"I will again anticipate by saying that, at the direction of this Board, I have sent postal notices to all who were delinquent or not prompt in the matter of returning, and the resulting responses would seem to indicate that not only will return be made in future, by all upon whom the duty of reporting devolves, but that the returning will be characterized by promptness, and that the legal limit of thirty days' grace will not be overstepped.

"In looking over the record of mortality by cities and towns, it may be seen that the death rate in Jersey City, Hoboken, Bayonne, (cities,) Harrison, (town,) West Hoboken, Guttenberg, Kearny and Union, (townships,) fell more or less *below* the mean county rate. In the cases of town of Union, North Bergen and Weehawken townships the rate rose considerably above the mean county rate. In the cases of all these places, the rates are higher than for the other yearly rates in the table, with the exception that the rates for Hoboken and

Kearny were lower than for 1881. The high rate of North Bergen township resulted from the outbreak of typho-malarial fever in the winter and spring months of 1882 in the almshouse, and from the fact that so many of the county institutions, having usually a very high death rate, are located here. The small-pox hospital is situated in this township.

"The table here appended shows the area and population of the different 4340 districts and is valuable for reference.

Names of Cities, &c.	Population. Census 1880.	Area in Acres.	Sq. Miles.
Jersey City	120,728	8,000	12.50
Hoboken City	30,999	720	1.12
Bayonne City	9,372	2,500	3.90
Town of Harrison	5,510	760	1.20
Town of Union	5,849	275	.43
Town of Guttenberg	1,206	....	.. ..
Township West Hoboken	5,441	520	.81
Township North Bergen	4,268	6,800	10.62
Township Kearny	2,165	6,400	10
Township Union*	1,310	835	1.30
Township Weehawken	1,102	400	.62

* This township divided (1878) into Guttenberg, (town,) and Union township."

The increase of 1258 deaths in Essex county depends chiefly on an increase of 1028 in the city of Newark. While the death rate under one is large, the rate between one and five is especially indicative of some local conditions which affect this portion of the growing population.

For the State at large, the increase of deaths under one year has been 1305; for from one to five years, 1590; from five to twenty years, 810; from twenty to sixty, 762, and over sixty, 476.

The loss of about 2300 children more under five years and the comparatively less number that reach an age beyond sixty years, are related facts. The causes that destroy the infant population tell on those who still live, and a county with a high child death rate always finds that in older life there is limit of age and limit of power.

It is not needful, in this synopsis, to follow out all the comparisons that can be made between different localities and different cities or between the ages and the diseases which destroy so many lives. But all through these tables, the vital statistician and the sanitarian will not fail to perceive indications or to get on the trail of inquiries which are informatory and most helpful in guiding to the necessity of more intelligent health administration. It is hoped, the next year, to give some comparative sketches of statistics over a period of time and relating to an amount of population which eliminates many limited or accidental or temporary influences. We only draw attention to these in order that physicians and sanitarians may be aiding in these inquiries. The tables in connection with this report show in detail the deaths by townships, by cities and by counties, and then of cities as compared with counties, and of cities, counties and the State in their relative significance. A further comparison of ages and of diseases gives still more specific character to these comparisons and the information to be derived therefrom. It is never wise to attach too much importance to a limited or varying death rate which represents less than 10,000 persons, and even this needs to be connected by comparisons by the hundred thousand and by that of the same population in succeeding years.

It is because of the little value of isolated observations over small fields, conducted without symmetry of method, and of the great value of the analyses of assemblages of facts which admit of practical study, that it is so important to gather all the facts in one place and to put them in such form and order as to admit of study and life-saving deduction. Besides the actual work done, it thus becomes possible, at any future time, that provision may be made therefor to derive information on many points of vital and social interest, on which investigation may be deemed desirable.

It is noticeable that, in the last statistical year, the two northern counties of Sussex and Warren had an increase of disease not in accord with their usual experience. Most of the townships show a higher death rate, but the increase has been chiefly owing to localities.

Newton more than doubled its death rate, owing both to typhoid and scarlet fevers and a general increase of disease, which betokens some defects in administration, certainly not in location. Hardyston has suffered much from an epidemic of scarlet fever and from increase in other respects, which tripled the death rate of the former year.

In Warren county, Phillipsburg shows an increase of 35 deaths,

which gives a much increased death rate. Washington township and borough, Hackettstown, Oxford, Harmony and Knowlton nearly doubled their death rates. Although the population of these localities is not compact, it has, in some of them, come our to knowledge that endemics are not properly dealt with by local Boards and that local nuisances exist. Our summary of local reports will give illustration of the different results attending a dilatory and a prompt dealing with such diseases as small-pox, diphtheria, scarlet fever, etc., as well as with general insanitary conditions that tend to foster disease.

For various other particulars and comparisons for various localities, we refer to the tables herewith furnished.

COMMENTS ON SPECIAL DISEASES.

Remittent Fever. This is a disease so rarely fatal and stands for so much in the way of malarial influence that, by numbers, it indicates a larger proportion of sickness and of suspension from labor than any other one disease. The record shows a decrease of about 50 deaths. An examination of localities indicates that, in the northern and middle portions of the State, there has been a very marked decrease, while in some of the southern counties, malaria has been more prevalent. Portions of Burlington, Camden, Cumberland and Ocean counties have suffered much. So long as undrained lands are made worse by obstruction of water-courses, by the building of cities without any preparatory drainage and by various other devices for combining heat, moisture and decaying vegetation, we shall not fail to secure materials which ever and anon will fill the inbreathed air and cause some form of periodic fever. Not only will such places suffer, but occasionally the winds or other favoring conditions will extend the miasm to localities which have good local conditions, and so the people at large come to have an interest in the abatement of such evils to the public health. Our laws, now, well provide for drainage wherever the public sentiment of the people demands it. The interests, both of agriculture and health, are largely promoted thereby. It is encouraging to find that citizens in affected localities are more and more recognizing the relations of saturated soils to malaria, and more care is taken as to ponds and stagnant water. But all this will not avail, until, in certain parts of the State, more extended drainage is conducted under the provisions of the State law.

Typhoid Fever. We have had occasion, in a separate article, to notice three outbreaks of fever, regarded as typhoid and especially connected with foul cesspools. Our reports from time to time give additional instances where one family suffers, or some one part of a city. These cases of local outbreak seldom fail to reveal on the premises a foul cesspool or a contamination of drinking-water, which seems to explain the occasion of the sickness.

The deaths from typhoid fever for the year were 884, as against a record of 499 in the previous year. Cumberland, Essex, Hudson and Passaic show the largest increase, but the gradual advance of the disease in the State must not escape public attention. It is not like malaria or diffused miasm, but a nosocomal or people and house-manufactured disease. Five hundred and twenty-seven of the cases occurred in cities, 310 being the record of the previous year. The most prominent advance was in Jersey city, Newark, Paterson, Camden and Hoboken. One cannot look over the statistical record of the last four years, making due allowance for certain local and institutional death rates, without being convinced that the uniform progress of this disease needs the most careful attention of local authorities. It counts its victims, not among the old—as its occurrence is very rare in those past fifty years of age—children over five and youths and men and women in young and middle life are its victims, while every case of death indicates numbers who have lived after long weeks of suspended labor and often with permanent impairment of vital power. While the question is fairly before the medical profession whether we have not mongrel forms of household and city fever, which differ somewhat from the abdominal typhus or typhoid and yet are fevers of putridity, it is not an open question whether these diseases are not, in their inception, due to the accumulated filth made incident to animal life, or to infiltration of the poison derived from persons who have contracted the disease. It is one of those diseases which are preventible, but can only be prevented by a knowledge of sanitary laws and by their enforcement.

Small-pox. Small-pox presents a record of 367 deaths, as against that of the year previous of 254 and of 15 for the year from July 1st, 1879, to July 1st, 1880. Our record for this year does not include the summer and fall epidemic at Paterson, which was mostly after July 1st. Although there has been this increase—an increase which proper and timely vaccination would wholly have prevented—yet we

are glad to know that the State oversight of the public health has in it been shown to be of very great advantage. Never, since the adoption of vaccination, has the county at large experienced such a wide-spread small-pox epidemic. New Jersey, as a centre of railroad communication and as exposed to all the risks of immigrant transfer, has had to contend with a great many local outbreaks. Our experience at Camden, the year before, led this Board to put itself in active communication with local Boards of Health, to insist upon early isolation and extended vaccination, and thus enable the local authorities to forestall any great extension of the disease. The law as to school vaccination, passed March 11th, 1880, was very effective as an aid, and school boards availed themselves of its provisions. Much space could be occupied in illustrating by local cases the promptness and efficiency of these Boards, with here and there an equally forcible instance of inadequate power or of a failure to follow the outline of prevention indicated. The summary from the local reports of this year, as given in this report, has some suggestive instances. Physicians as well as the laity have carefully availed themselves of the instructions which have been disseminated by our circulars and by correspondence. The importance of a proper vaccination and the troubles arising from a too disseminated production of lymph have been such as to lead the Board in this report to furnish valuable information from several acknowledged authorities. While the Board does not deem it advisable to ask for the authorization of a State vaccine farm, it does believe that it is not invidious for it to inspect or authenticate the sources from which the lymph is to be derived and to help to protect the people from those risks which have been incurred. Yet, it is to be remembered that so wide-spread a demand is not likely soon again to recur and that the lessons learned are such as almost to assure safe sources of supply. We believe now that every careful physician, who either obtains his supply directly from the producer or cultivates it in human remove, can be as certain as to its purity as he is as to the reliability of any medicine he is called upon to furnish.

Scarlet Fever. Scarlet fever had a marked increase during the winter of 1881–2 and the spring of 1882. The record for the year is 1306 deaths as in contrast with 499 of the previous year and 573 of the year before that. Of this, the greatest excess occurred in Essex, Hudson, Morris, Passaic, Sussex and Warren counties. Eight hundred and twenty-one of the whole number occurred in cities of

over 5000 inhabitants. Two hundred and sixty-eight of the excess of Essex was in Newark; 81 of that of Hudson, in Jersey City; 90 of that of Passaic, in Paterson, while that of Morris, Sussex and Warren counties was mostly in townships.

We are not as familiar with the circumstances which favor the origin of scarlet fever as with those of some other diseases. Yet, as it is more contagious and more fatal when it occurs in ill-kept houses or in close and low districts, we have much control over its spread and virulence. It is a disease easy to limit in its extension if all clothing on the person or in the room of the patient is thoroughly aired, if the skin is well oiled and bathed before mingling with others, and if proper isolation is practiced. We can point to local Boards of Health and to physicians who almost invariably prevent a spread of the disease from one house to another, and often prevent new cases in the same house. It is, we think, spread more by the public schools than in any other way. Children are returned too soon or without proper preparation, to the schools, or pupils attend from the same house during the sickness in it.

Whenever a case of small-pox, scarlet fever, measles or diphtheria occurs in a family, in some way, either the head of the family or the physician should be made responsible that every child from that family (and, often, it must apply to the house) should be prohibited from attendance at school or from mingling with others without a permit. How this shall be accomplished is a matter admitting of discussion more full than can be attempted here. But as to it, we think the following suggestions may be borne in mind:

1. As it is a matter of great public concern and seriously involving human life, it cannot be safely left to the opinions of individuals, but must be regulated by some form of law.

2. Such law, while careful to be as lenient as it ought to be and tolerant of the opinions of others, must rest on the grounds of necessity and social expediency. The law and the courts and the public have their rights of protection from a common carrier of contagion. The judgment of these as expressed in law is even more sacred than the right of private judgment, because it is fully as likely to be based on an unprejudiced view of what the public safety requires.

3. We believe such laws should be flexible to this extent, that the case being properly reported to the proper officer, the physician or head of family may, in some instances, be allowed to agree to take the responsibility of proper isolation and protection. The proper method,

both of regulative law and of securing a correct sentiment among physicians, Health Boards, School Boards and the people, will be discussed more fully at another time.

As scarlet fever is a disease so often fatal, and as it is not apt to be contracted by adults, except where there is some special concentration of the poison, the methods of limiting the disease, both by isolation of the patient and dilution of the poison should be sedulously enforced.

The contagion is not very diffusive. Experiments in hospitals and close observation in single cases seem to show that the disease is very rarely contracted beyond five feet from the patient, if none of the unaired garments or bed-clothing or secretions do not come any nearer than this to others. So if cleanliness of the person and of the room and of the attendant is secured, it is not a very communicable disease. As with it there is much separation of particles from the outside skin, whether of secretion or the epithelial layer itself, oiling and washing, as with a little warm borax-water, are quite efficient in preventing the conveyance of particles to others or to surrounding garments and furniture. In addition, it is the belief of many that potassium chloride, weak solutions of ferrum chloride, sulphur, etc., applied to the mouth and throat beforehand, are apt to prevent the absorption of the poison.

Measles. The record shows for the State 206 cases of death by measles, in place of 70 and 87 the two previous years, respectively. Of these, 156 cases were within city limits. This occurs, not because the disease is so much severer in cities, but chiefly from the greater density of population. This number of deaths stands for a great number of cases. The disease was epidemic in many parts of the State. It is unfortunate that it often leaves enfeeblement of lung tissue or some impairment of perfect respiration. Colds, bronchitis, pleurisy and consumption are too frequent sequelæ. Next to small-pox, it is the most communicable of the zymotic diseases; so much so, that in mild epidemics and in favorable seasons of the year, some parents deem it wise to take no special precautions to protect their children from exposure. It often occurs almost with regularity at periods between five to seven years, because these are the ages at which young children most generally make their first appearance at school or where there can be more general exposures. Yet, the disease is one in which preventive and mitigating measures are very important. Evenness of temperature, protection from cold winds and not too early return to school or other duties are very important.

Whooping Cough. Whooping cough is, at times, quite a fatal disease in England and sometimes shows much severity in damp and variable climates here. The colder months of 1882 and 1883 showed the unusual mortality of 253 against 119 of the year before. For the last three years it has had a higher range of mortality in this State than measles. This is in part because it is so seldom submitted to hygienic care or medical treatment in the earlier stages. Also, as it has both nervous and pulmonary irritations, it often causes diseases of the reflex nervous system or invades both systems of nerve life. Its spasmodic character and its tendency to congest the small vessels of the lungs, often need early attention. Warm clothing, protection from draughts and an equable temperature have much influence over it. There is reason to believe that the contagion is spread by the sputa and sometimes by the dried mucus which becomes mingled with floating particles in the atmosphere of rooms.

Croup and Diphtheria. In recent years, these have so prominently and fatally added to the diseases of childhood as to command our most inquisitive attention. While the disease is more manageable than formerly, it is not less virulent in some of its localized outbreaks.

The increase from 873 in 1879–80 to 1728 in 1880–81 and 1472 in 1881–82 well deserves a most careful study. One thousand and fifty-one of these cases were in cities. As the cities of over 5000 inhabitants represent just about one-half of the population of the State, (576,950,) this proportion does not confirm the somewhat prevalent idea that the disease exists as much in the country as in cities. Local outbreaks in the country seem to be equally virulent, and too often we have to record several of a family group as swept off by this virulent disease. But it is not so often transmitted from one to another as in cities, since we have come to know more as to the importance of isolation. While the particle of contagion is obscure, the connection of its fatal fertility with filth, bad air, household accumulation and stagnant dampness cannot be doubted. It may fall or grow amid other soil, but these are its forcing-places.

Two notable instances in this State connect it with cesspool filth. In both of these—the one in Montclair and the other in Chambersburg—it occurred soon after the free spreading of cesspool deposit over grass-plots, and in both instances, seized the nearest family group, when the disease did not prevail in the vicinity. Sudden changes of atmosphere have much to do with outbreaks of the disease at points where its substance and its soil have been provided.

Hygiene has largely to do with its prevention and not less with the milding of the cases and the limiting of its spread when it occurs. It is ever apparent that good physicians often save the members of the family who are taken four or five days after their visit to the one first stricken, because they are able to modify the type, to dilute the contagion and to restrain its virulence. This is done not less by the hygienic than by the medical treatment. We refer for its more extended consideration to the Fourth Report of this Board, (1880,) pages 7–13, and to various articles on modes of disinfection as contained in the State reports.

Diarrheal Diseases. The record of 2792 deaths, as an increase over the 2255 and 2166 of 1880–81 and 1879–80, is a very significant record of the summer drought of 1881, and is the analogue of the pulmonary diseases which marked the previous winter. All but 95 of these cases were in persons under twenty—as most cases of adult disorder of this kind are classified with the diseases of the digestive and intestinal track. Besides, many who die under one month are returned as from this cause, but are not added to this tabulation. Of these, 1814 died in cities. While excessive heat determines the fact of a high death rate from this cause with children, it is chiefly children of two classes that suffer—those that are dependent solely on cow's milk or other artificial food, and those who, by neglect or promiscuous feeding or by dwelling amid impure surroundings, are exposed to insanitary influences. Impure water, poor milk, ill-prepared food and foul air affect the intestinal canal much oftener than they give rise to specific forms of fever. The children of the laboring classes suffer much from too frequent piece-meal systems of feeding and from bad cookery. Foods otherwise digestible thus come to be irritants and cause serious derangement of the stomach and bowels. The tax of this kind of sickness is so great upon industrial life that social science and political economists have deemed it worthy of their notice. Both in New York City and Philadelphia much good has been done by a series of hygienic directions to mothers and by a system of summer sanitary inspection. Many of the children who are sacrificed by these summer diseases are not naturally very delicate, and die as the direct result of outside causes. Bereavements to the family thus too often become bereavements to the State.

Consumption and Acute Lung Diseases. The havoc which this

great destroyer of mankind makes in our own State was pointed out and its causes discussed in a special article in our last report. Three thousand, four hundred and seventy-five deaths occurred from this cause instead of 2989, as in the previous year. Of these, 2102 were in cities of over 5000 inhabitants. Our office records show that in the cities the excess of deaths among females was 20, and in the country, 83.

The large city rate is very informatory as to the influence of foul air and city dampness. While the disease is seldom checked when fully developed, the advance of pathology shows how frequently it is an induced disease.

In connection therewith, acute lung diseases also need to be noticed. Two thousand seven hundred and fifty-two deaths occurred from these, or an increase of 544 from the former year—very nearly the same increase as from consumption. Of these, 1741 were in cities, showing also nearly the same relative increase. While many causes are at work to produce the various forms of lung disease, either acute or chronic, the most careful observers and students of statistics have not failed to recognize the paramount influence of impure air and moist conditions of soil, in which the exchanges between earth and air are artificially embarassed. While in the city the first factor is the most prominent, yet, the undrained land of some country districts is fully offset by the high level of ground water and the mingling of stagnant water and stagnant decaying material in the uncropped soil of our cities—uncropped saved as it is diverted from the support of vegetable to the destruction of the higher animal life.

Brain and Nervous Diseases of Children. The record of increase is not so excessive with these, although 357 more for the State than the previous year. Of the 1999 deaths from this cause, 1364 occurred in cities of over 5000 inhabitants, whereas the relative share would have been about 1000.

So many influences tend to enfeeble the brain and nervous system, to overtax it or to subject it too early to tobacco or other toxics, that it is very difficult to single out each factor and affirm its relative significance. There can be no doubt that we need to study in the interests of population that nervous irritability which is so often early manifest and to guard against that class of degenerative changes which is, of all others, most disastrous in its effect on life.

There are some questions as to early discipline, both in the home

and in the school, that may well be started or that start themselves and need careful analysis and reply. It is not alone that there is over-cramming, but the sins of omission are greater than those of commission. Bodily training, habit-teaching and healthy discipline seem to have vanished as systems. They are talked about, they are patronized, but they find little place in the care of infant and of school life. The care of childhood as something to be aided and directed and drilled in harmonious physical development must have fuller recognition if we would have a diminution of those brain and nervous diseases of children which now sum up so large a number in the causes of fatality.

Other Diseases. After so many notices of increased mortality, it is pleasant, as we come to such adult diseases as those of the heart and circulation, to urinary diseases, to adult brain diseases, erysipelas, digestive and intestinal diseases, and cancers, to find no marked increase.

Acute rheumatism has been less frequent. Puerperal diseases show a favorable diminution. It thus appears that it is life before adult age that has chiefly suffered—a fact, the contrast of which points very plainly to most of the causes of the increased mortality as artificial.

NUMBER OF MARRIAGES, BIRTHS AND DEATHS, BY TOWNSHIPS.

Atlantic County.

	M.	B.	D.
Absecon	5	10	14
Atlantic City	45	90	174
Buena Vista	....	17	10
Egg Harbor City	18	34	33
Egg Harbor Township	26	66	65
Galloway	6	39	41
Hamilton	9	39	29
Hammonton	21	45	27
Mullica	3	5	6
Weymouth	1	17	9
	134	362	408

Bergen County.

	M.	B.	D.
Englewood	25	28	64
Franklin	13	54	41
Harrington	16	28	25
Hohokus	20	58	28
Lodi	13	107	82
Midland	9	19	34
New Barbadoes	57	113	104
Palisade	12	36	26
Ridgefield	17	61	88
Ridgewood	13	34	31
Saddle River	3	18	21
Union	14	67	65
Washington	11	43	40
	223	666	649

Burlington County.

	M.	B.	D.
Bass River	3	31	23
Beverly	13	14	54
Bordentown	47	107	90
Burlington	59	83	166
Chester	29	71	36
Chesterfield	12	31	27
Cinnaminson	14	44	38
Delran	8	10	22
Evesham	12	39	31
Eastampton	1	10	9
Florence	8	30	18
Little Egg Harbor	18	39	34
Lumberton	....	12	12
Mansfield	9	39	17
Medford	11	33	30
Mt. Laurel	2	20	19
New Hanover	28	46	38
Northampton	53	88	97
Pemberton	19	47	65
Randolph	3	9	9
Shamong	3	17	16
Southampton	17	37	29
Springfield	6	40	28
Washington	1	7	11
Westampton	1	18	6
Willingboro	2	15	20
Woodland	....	2	3
	374	939	948

Camden County.

	M.	B.	D.
Camden	443	696	1023
Centre	3	41	25
Delaware	....	23	25
Gloucester City	39	159	98
Gloucester	10	61	61
Haddon	19	73	51
Stockton	14	52	58
Waterford	10	29	24
Winslow	5	52	41
	543	1186	1406

Cape May County.

	M.	B.	D.
Cape May City	24	42	24
Dennis	13	43	31
Lower	6	53	29
Middle	11	46	22
Upper	11	43	28
	65	227	134

Cumberland County.

	M.	B.	D.
Bridgeton	118	219	208
Commercial	12	28	41
Deerfield	12	24	15
Downe	16	28	24
Fairfield	17	85	41
Greenwich	11	20	16
Hopewell	10	31	31
Landis	66	130	106
Maurice River	15	50	48
Millville	100	266	136
Stoe Creek	8	32	21
	385	913	687

Essex County.

	M.	B.	D.
Belleville	19	77	64
Bloomfield	37	125	83
Caldwell	20	57	45
Clinton	19	42	39
East Orange	25	193	113
Franklin	13	20	31
Livingston	10	16	19
Millburn	23	33	32
Montclair	26	126	101
Newark	1353	3646	3925
Orange	125	417	337
South Orange	22	83	69
West Orange	11	64	67
	1703	4899	4925

Gloucester County.

	M.	B.	D.
Clayton	25	39	33
Deptford	1	88	22
East Greenwich	6	31	20
Franklin	11	65	34
Glassboro	14	77	65
Greenwich	6	32	25
Harrison	15	43	53
Logan	9	29	20
Mantua	15	42	28
Monroe	8	50	26
Washington	13	31	31
West Deptford	....	34	23
Woodbury	30	58	47
Woolwich	16	57	44
	169	626	471

Hudson County.

	M.	B.	D.
Bayonne	61	161	253
Guttenberg	8	24	33
Harrison	6	148	172
Hoboken	330	695	976
Jersey City	826	1288	3646
Kearney	4	24	36
North Bergen	7	48	317
Town of Union	65	150	216
Union	4	18	34
Weehawken	1	13	40
West Hoboken	30	140	138
	1342	2709	5861

Hunterdon County.

	M.	B.	D.
Alexandria	6	20	22
Bethlehem	15	46	55
Clinton township	4	26	37
Delaware	15	43	40
East Amwell	12	29	26
Franklin	14	21	9
Frenchtown	11	12	22
High Bridge	14	49	36
Holland	8	38	18
Kingwood	8	32	18
Lambertville	38	71	69
Lebanon	19	55	47
Raritan	19	66	54
Readington	16	58	52
Tewksbury	23	43	27
Town of Clinton	14	17	10
Union	3	12	14
West Amwell	3	12	14
	242	650	570

Mercer County.

	M.	B.	D.
Chambersburg	31	149	138
East Windsor	21	29	41
Ewing	8	21	85
Hamilton	11	46	78
Hopewell	32	59	77
Lawrence	10	41	55
Millham	2	27	3
Princeton	29	99	85
Trenton	344	588	615
Washington	2	19	17
West Windsor	9	15	18
	499	1093	1212

Middlesex County.

	M.	B.	D.
Cranbury	13	37	29
East Brunswick	30	78	69
Madison	2	18	20
Monroe	25	37	42
New Brunswick	178	405	390
North Brunswick	8	27	20
Perth Amboy	75	190	135
Piscataway	16	62	54
Raritan	16	65	59
Sayreville	14	26	22
South Amboy	30	71	89
South Brunswick	5	40	41
Woodbridge	11	78	85
	423	1129	1055

Monmouth County.

	M.	B.	D.
Atlantic	9	24	31
Eatontown	13	22	44
Freehold	49	71	80
Holmdel	1	25	16
Howell	23	72	64
Manalapan	16	46	27
Marlboro	11	29	27
Matawan	22	34	72
Middletown	31	73	83
Millstone	18	33	27
Neptune	53	125	176
Ocean	47	165	147
Raritan	41	85	81
Shrewsbury	44	127	128
Upper Freehold	28	48	60
Wall	39	140	86
	445	1119	1149

Morris County.

	M.	B.	D.
Boonton	[illegible]	[illegible]	[illegible]
Chatham	[illegible]	[illegible]	[illegible]
Chester	[illegible]	[illegible]	[illegible]
Hanover	[illegible]	[illegible]	[illegible]
Jefferson	[illegible]	[illegible]	[illegible]
Mendham	[illegible]	[illegible]	[illegible]
Montville	[illegible]	[illegible]	[illegible]
Morristown	[illegible]	[illegible]	[illegible]
Mount Olive	[illegible]	[illegible]	[illegible]
Passaic	[illegible]	[illegible]	[illegible]
Pequannock	[illegible]	[illegible]	[illegible]
Randolph	[illegible]	[illegible]	[illegible]
Rockaway	[illegible]	[illegible]	[illegible]
Roxbury	[illegible]	[illegible]	[illegible]
Washington	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]

Ocean County.

	M.	B.	D.
Berkeley	[illegible]	[illegible]	[illegible]
Brick	[illegible]	[illegible]	[illegible]
Dover	[illegible]	24	[illegible]
Eaglewood	[illegible]	[illegible]	[illegible]
Jackson	[illegible]	[illegible]	[illegible]
Lacey	[illegible]	[illegible]	[illegible]
Manchester	[illegible]	[illegible]	[illegible]
Ocean	[illegible]	[illegible]	[illegible]
Plumsted	[illegible]	40	[illegible]
Stafford	[illegible]	[illegible]	[illegible]
Union	[illegible]	[illegible]	[illegible]
	84	[illegible]	[illegible]

Passaic County.

	M.	B.	D.
Acquackanonk	3	30	21
Little Falls	15	30	39
Manchester	2	12	21
Passaic	71	214	149
Paterson	568	1517	1512
Pompton	29	35	47
Wayne	3	9	17
West Milford	24	48	45
	715	1805	1851

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Hammonton	21	45	27
Mullica	3	5	6
Weymouth	1	17	9
	134	362	408

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Harrington	16	28	25
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Lodi	13	107	82
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Washington	11	43	40
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Delran	8	10	22
Evesham	12	39	31
Eastampton	1	10	9
Florence	8	30	18
Little Egg Harbor	13	39	34
Lumberton	....	12	12
Mansfield	9	39	17
Medford	11	33	30
Mt. Laurel	2	20	19
New Hanover	28	46	38
Northampton	53	88	97
Pemberton	19	47	65
Randolph	3	9	9
Shamong	3	17	16
Southampton	17	37	29
Springfield	6	40	28
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Gloucester	10	61	61
Haddon	19	73	51
Stockton	14	52	58
Waterford	10	29	24
Winslow	5	52	41
	543	1186	1406

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Glassboro	14	77	65
Greenwich	6	32	25
Harrison	15	43	53
Logan	9	29	20
Mantua	15	42	28
Monroe	8	50	26
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Union	4	18	34
Weehawken	1	13	40
West Hoboken	30	140	138
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Holland	8	38	18
Kingwood	8	32	18
Lambertville	38	71	69
Lebanon	19	55	47
Raritan	19	66	54
Readington	16	58	52
Tewksbury	23	43	27
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Raritan	16	65	59
Sayreville	14	26	22
South Amboy	30	71	89
South Brunswick	5	40	41
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Freehold	49	71	80
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Howell	23	72	64
Manalapan	16	46	27
Marlboro	11	29	27
Matawan	22	34	72
Middletown	31	73	83
Millstone	18	33	27
Neptune	53	125	176
Ocean	47	165	147
Raritan	41	85	81
Shrewsbury	44	127	128
Upper Freehold	28	48	60
Wall	39	140	86
	445	1119	1149

Morris County.

	M.	B.	D.
Boonton	25	67	53
Chatham	16	49	86
Chester	10	59	47
Hanover	15	56	125
Jefferson	9	19	26
Mendham	17	38	24
Montville	14	20	39
Morristown	29	104	121
Mount Olive	11	51	36
Passaic	8	35	30
Pequannock	7	39	54
Randolph	67	171	146
Rockaway	49	131	145
Roxbury	20	47	38
Washington	11	73	34
	308	959	999

Ocean County.

	M.	B.	D.
Berkeley	2	17	9
Brick	14	55	36
Dover	20	64	33
Eagleswood	7	13	15
Jackson	7	38	17
Lacey	5	20	16
Manchester	6	31	18
Ocean	2	10	11
Plumsted	6	40	28
Stafford	7	8	19
Union	8	25	18
	84	321	220

Passaic County.

	M.	B.	D.
Acquackanonk	3	30	21
Little Falls	15	30	39
Manchester	2	12	21
Passaic	71	214	149
Paterson	568	1517	1512
Pompton	29	35	47
Wayne	3	9	17
West Milford	24	48	45
	715	1895	1851

Salem County.

	M.	B.	D.
Elsinboro	....	7	5
Lower Alloways Creek	9	20	13
Lower Penn's Neck	4	19	24
Mannington	1	40	60
Oldmans	3	26	17
Pilesgrove	33	64	69
Pittsgrove	11	44	41
Quinton	....	36	20
Salem	51	110	98
Upper Alloways Creek	11	35	30
Upper Penn's Neck	17	43	43
Upper Pittsgrove	10	30	36
	150	474	456

Somerset County.

	M.	B.	D.
Bedminster	12	22	40
Bernards	14	55	47
Branchburg	4	32	24
Bridgewater	74	170	154
Franklin	21	47	73
Hillsborough	17	45	52
Montgomery	6	34	28
North Plainfield	11	67	60
Warren	5	17	26
	164	489	504

Sussex County.

	M.	B.	D.
Andover	11	15	29
Byram	15	17	24
Frankford	6	27	26
Greene	....	16	4
Hardyston	12	9	70
Hampton	14	14	13
Lafayette	18	3	18
Montague	4	6	15
Newton	25	38	66
Sandyston	8	21	23
Sparta	15	30	44
Stillwater	14	23	39
Vernon	12	17	30
Walpack	3	8	4
Wantage	22	43	54
	179	297	459

Union County.

	M.	B.	D.
Clark	1	5	9
Cranford	....	10	10
Elizabeth	269	813	612
Fanwood	5	16	17
Linden	4	23	33
New Providence	2	18	21
Plainfield	67	146	151
Rahway	51	96	183
Springfield	4	17	10
Summit	10	41	41
Union	8	33	27
Westfield	10	41	58
	431	1258	1177

Warren County.

	M.	B.	D.
Alamuchy	....	17	11
Belvidere	14	32	34
Blairstown	13	49	28
Franklin	18	11	30
Frelinghuysen	6	21	6
Greenwich	21	43	51
Hackettstown	23	61	58
Hardwick	....	6	7
Harmony	6	37	31
Hope	9	34	35
Independence	5	21	16
Knowlton	10	11	38
Lopatcong	4	42	20
Mansfield	8	12	50
Oxford	25	125	112
Pahaquarry	....	8	1
Phillipsburg	64	243	169
Pohatcong	2	9	12
Town of Washington	27	84	64
Washington	4	21	32
	259	907	818

Totals of Marriages, Births and Deaths for all the Counties.

	M.	B.	D.
Atlantic	134	362	408
Bergen	223	666	649
Burlington	374	939	948
Camden	543	1180	1406
Cape May	65	227	134
Cumberland	385	913	687
Essex	1703	4999	4925
Gloucester	169	626	471
Hudson	1342	2709	5861
Hunterdon	242	850	570
Mercer	499	1093	1212
Middlesex	423	1129	1055
Monmouth	445	1119	1149
Morris	308	959	929
Ocean	84	.321	220
Passaic	715	1895	1851
Salem	150	474	456
Somerset	164	489	504
Sussex	179	287	459
Union	431	1258	1177
Warren	259	907	818
	8837	23,108	25,959

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

COUNTIES. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undef'ed.	Population, census of 1880.*	Death rate per 1,000.
Atlantic	114	61	38	108	103	4	406	18,704	21.71
Bergen	119	139	67	180	158	5	649	35,786	17.64
Burlington	169	115	69	248	297	13	948	55,402	17.11
Camden	385	213	145	397	261	13	1,404	62,942	22.30
Cape May	39	15	15	33	69	4	154	9,765	15.72
Cumberland	139	118	82	169	186	6	690	37,687	18.31
Essex	1,107	1,154	578	1,336	717	19	4,911	189,929	25.86
Gloucester	125	44	41	129	129	8	471	25,886	18.19
Hudson	1,448	1,220	712	1,769	642	10	5,840	187,944	31.07
Hunterdon	108	41	40	135	244	6	570	38,570	14.77
Mercer	365	145	119	406	363	29	1,309	58,061	20.89
Middlesex	228	151	113	211	331	11	1,065	52,286	20.18
Monmouth	260	129	106	337	306	25	1,163	55,536	20.76
Morris	177	147	128	302	225	10	989	50,861	19.64
Ocean	55	16	18	79	48	2	219	14,455	15.16
Passaic	500	322	197	540	284	4	1,847	68,860	26.82
Salem	91	64	50	104	127	9	455	24,579	18.51
Somerset	99	59	64	129	165	5	504	27,162	18.55
Sussex	68	75	54	116	126	14	455	23,539	19.33
Union	305	235	130	318	286	5	1,177	55,571	21.18
Warren	174	146	163	178	174	10	814	36,589	22.24
Totals	5,364	4,378	2,866	7,387	4,963	212	25,910	1,131,117	22.90

COUNTIES.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.
Atlantic	....	13	2	10	1	14	12	66	36	33	32
Bergen	16	19	6	35	3	3	30	66	65	52	55
Burlington	17	40	3	11	7	11	39	90	66	64	101
Camden	28	65	3	40	2	11	46	194	81	108	120
Cape May	3	10	....	3	3	....	....	9	10	9	11
Cumberland	3	55	....	8	....	7	64	64	60	67	42
Essex	63	112	19	401	64	60	401	474	358	519	561
Gloucester	6	21	5	9	....	6	11	61	33	42	45
Hudson	86	236	277	266	70	42	443	660	581	536	659
Hunterdon	9	24	1	13	3	6	8	47	36	35	54
Mercer	18	37	19	10	11	11	43	198	115	105	119
Middlesex	16	33	11	43	1	9	45	110	57	60	104
Monmouth	9	24	5	40	3	11	33	120	69	73	113
Morris	21	36	....	36	1	7	50	76	68	63	129
Ocean	....	10	....	1	1	2	13	16	19	19	16
Passaic	30	61	3	124	3	14	55	260	130	120	205
Salem	5	33	....	7	1	13	27	30	30	42	30
Somerset	14	12	....	10	6	3	22	42	17	23	53
Sussex	9	17	....	44	2	....	26	33	21	26	39
Union	24	21	3	72	30	15	62	114	70	66	137
Warren	9	27	10	63	5	6	62	56	33	46	73
Totals	379	854	387	1306	306	262	1473	2799	1696	1779	2768

COUNTIES.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Atlantic	33	30	18	30	....	11	8	....	4	6
Bergen	54	37	16	30	1	15	12	1	10	27
Burlington	60	49	31	78	5	21	21	....	9	30
Camden	110	61	30	60	2	32	35	1	16	32
Cape May	12	5	2	11	....	1	4	....	1	4
Cumberland	56	33	23	47	5	30	4	1	6	19
Essex	497	160	160	242	12	118	78	7	44	94
Gloucester	33	26	10	30	1	12	8	1	6	13
Hudson	538	198	131	210	16	141	52	8	49	235
Hunterdon	23	56	36	65	4	14	20	2	8	21
Mercer	63	52	26	109	10	56	22	3	5	37
Middlesex	64	45	33	61	4	30	222	5	10	50
Monmouth	65	78	61	114	4	43	19	5	5	41
Morris	67	37	32	68	1	35	15	2	10	38
Ocean	19	13	1	13	1	10	3	3	3	2
Passaic	135	73	60	74	7	75	28	6	16	45
Salem	20	25	6	26	2	17	13	1	4	8
Somerset	34	41	19	51	6	34	10	1	9	19
Sussex	33	33	21	27	2	23	8	....	7	16
Union	118	56	25	57	4	31	34	1	12	48
Warren	66	43	14	56	5	22	9	4	10	18
Totals	1,206	1,181	765	1,581	94	740	403	58	244	798

Death-rate per 1,000 from these diseases, exclusive of accidents, 18.41. Note that consumption has two columns.

* On page 317, 5th Report, "1875" should be "1880," and the addition of diarrheal diseases, page 316, is 2,305.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

Cities having over 5,000 population. Statistical Divisions.	Deaths at all ages. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.	Principal causes of death. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal Diseases.	Consumption. M.	Consumption. F.	Acute lung Diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Atlantic County.																														
Atlantic City	68	34	10	41	21	....	174	5,477	31.76	....	5	....	5	....	3	6	27	8	12	13	11	11	7	14	....	3	4	....	1	4
Burlington County.																														
Bordentown	10	16	5	24	34	1	90	5,334	16.88	2	1	1	1	....	1	7	6	7	7	6	6	9	4	11	1	....	3	....	....	3
Burlington	34	16	28	45	51	4	166	7,237	22.94	6	3	....	1	....	....	11	15	17	19	13	8	11	7	13	....	3	4	....	1	4
Camden County.																														
Camden	294	166	112	291	156	13	1,032	41,659	24.66	27	30	2	37	2	7	28	143	57	64	108	80	38	32	54	1	14	25	1	12	36
Gloucester City	29	10	11	30	18	..	98	5,347	18.33	1	6	....	....	....	....	2	12	7	9	9	9	1	3	9	1	....	1	....	....	3
Cumberland County.																														
Bridgeton	87	29	36	47	45	5	249	8,722	28.55	2	18	....	1	....	3	42	14	14	12	16	18	10	4	11	1	7	1	....	1	10
Millville	26	22	24	41	33	1	136	7,660	17.75	....	26	....	1	....	....	3	19	6	15	6	12	3	6	7	....	4	....	....	3	3
Essex County.																														
Newark	871	989	449	1,096	502	16	3,912	136,508	28.66	42	97	19	310	60	47	309	374	289	363	494	377	161	128	189	10	81	56	6	82	76
Orange	63	68	44	84	59	1	336	13,207	25.44	2	5	....	28	....	6	27	34	27	17	36	35	12	11	12	1	6	5	....	7	6
Hudson County.																														
Bayonne	73	63	25	74	18	....	252	9,372	26.89	5	9	....	11	1	1	13	31	8	12	50	26	4	7	9	....	8	1	....	2	16
Harrison	36	36	19	62	17	1	170	6,898	24.61	7	6	....	10	1	3	8	16	17	13	23	26	5	3	4	....	3	1	2	1	4
Hoboken	264	223	106	286	93	....	974	30,999	31.42	12	27	26	41	5	8	118	181	68	69	91	96	40	34	94	3	11	10	1	11	33
Jersey City	916	774	450	1,121	377	6	3,636	120,722	30.12	25	156	209	166	66	26	224	417	221	213	413	311	120	61	187	15	106	37	4	29	147
Union	69	66	40	42	19	....	216	5,849	36.93	2	3	4	14	1	....	47	28	9	10	16	31	8	6	6	....	5	2	....	8	3
Mercer County.																														
Chambersburg	48	21	19	37	18	3	136	5,437	25.01	2	6	....	4	....	4	8	21	7	8	22	9	5	1	5	....	5	1	....	....	2
Trenton	141	76	53	216	107	21	614	29,910	20.53	8	20	17	....	5	3	21	75	39	67	69	32	25	14	29	5	12	9	3	1	22
Middlesex County.																														
New Brunswick	90	57	40	113	75	4	391	17,166	22.78	6	13	9	30	....	4	14	46	30	37	36	30	14	15	17	3	11	12	1	1	12
Morris County.																														
Morristown	23	15	13	41	29	1	121	6,837	17.70	2	....	....	2	....	....	3	15	12	10	9	9	7	5	8	....	9	4	1	....	4
Passaic County.																														
Passaic	47	28	17	22	34	1	149	6,532	22.82	3	9	....	6	....	4	3	24	5	18	12	15	7	4	6	1	3	....	....	3	7
Paterson	417	290	180	403	221	....	1,511	51,031	29.61	24	49	3	101	3	10	87	222	106	112	178	108	57	51	59	6	63	19	6	12	21
Salem County.																														
Salem	19	11	10	28	23	3	99	5,056	19.58	3	5	....	1	....	....	2	5	6	12	7	7	4	2	9	....	....	6	....	1	1
Union County.																														
Elizabeth	148	131	74	165	91	3	612	28,229	21.69	13	7	....	41	10	6	26	65	38	39	56	70	28	10	33	....	18	11	1	4	30
Plainfield	34	30	20	30	47	....	161	8,125	18.59	....	2	....	5	7	....	10	17	5	17	23	9	6	7	10	1	8	3	....	....	8
Rahway	35	37	22	46	45	....	185	6,456	24.33	1	5	3	15	3	2	10	15	9	11	36	15	14	4	8	2	7	3	....	1	3
Warren County.																														
Phillipsburg	54	34	21	34	26	....	169	7,181	23.53	2	6	....	....	....	3	28	34	15	6	13	18	11	1	10	....	2	1	....	2	1
Totals	3,817	3,156	1,808	4,490	2,148	83	15,537	576,950	26.71	207	587	302	921	186	143	1086	1814	1041	1061	1741	1,254	598	457	696	50	579	230	26	126	457

Death-rate per 1,000 from these diseases, exclusive of accidents, 23.56.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending July 1st, 1882.

ATLANTIC COUNTY. Population....18,704	DEATH AT ALL AGES.									PRINCIPAL CAUSES OF DEATH.																				
Statistical Divisions.	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.	Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Absecon	4	3	1	3	2	1	14	507	......	....	....	....	1	....	....	2	2	1	1	....	2	2	....	1	....	....	....	....	....	1
Atlantic City	58	34	10	41	31	....	174	5,477	31.76	....	5	....	5	....	3	6	37	8	12	13	11	11	7	14	....	3	4	....	1	4
Buena Vista	1	1	2	3	3	....	10	886	......	....	1	....	....	1	....	....	....	1	....	2	....	1	....	2	....	....	....	....	....	....
Egg Harbor City	5	3	....	8	17	....	33	1,232	......	....	....	....	....	....	2	1	3	3	4	3	....	3	....	7	....	1	1	....	1	....
Egg Harbor Township	20	7	3	17	15	1	63	3,563	......	....	4	1	3	....	1	....	10	4	3	5	5	3	2	5	....	3	1	....	....	1
Galloway	9	3	3	12	14	....	41	2,337	......	....	....	....	1	....	2	2	1	6	5	4	1	2	1	4	....	2	2	....	1	....
Hamilton	9	8	2	2	6	2	29	1,464	......	....	....	....	....	1	5	1	8	....	2	3	2	1	1	2	....	....	....	....	....	....
Hammonton	5	1	1	13	7	....	27	1,776	......	....	1	1	....	....	1	....	2	3	5	1	1	1	2	1	....	2	....	....	1	....
Mullica	1	....	1	2	2	....	6	717	......	....	1	....	....	....	....	....	1	....	....	1	....	1	....	....	....	....	....	....	....	....
Weymouth	2	1	....	1	5	....	9	741	......	....	1	....	....	....	....	....	2	....	1	....	....	1	....	2	....	....	....	....	....	....
Totals	114	61	23	102	102	4	406	18,704	21.71	....	13	2	10	2	14	12	66	26	33	32	22	26	13	38	....	11	8	....	4	6

Death-rate per 1,000, without cities of over 5,000, 17.55. Death-rate of Atlantic City includes a very large summer population.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending July 1st, 1882.

BERGEN COUNTY. Population 26,786	DEATH AT ALL AGES.							Population, census of 1880	Death rate per 1,000	PRINCIPAL CAUSES OF DEATH.																				
Statistical Divisions.	Under one	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.			Remittent fever, &c.	Typhoid fever	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Englewood	14	15	4	21	5	5	64	4,076	......	2	1	....	....	....	....	1	11	6	1	6	10	10	1	....	....	1	3	....	2	....
Franklin	6	11	2	10	12	....	41	2,306	......	1	1	....	4	....	....	2	7	2	4	8	1	6	2	....	....	1	....	....	....	....
Harrington	3	4	4	8	7	....	26	2,570	......	....	1	....	4	....	....	....	1	1	2	2	1	2	....	1	....	1	....	....	....	2
Hohokus	8	3	2	5	10	....	28	2,920	......	....	....	....	....	....	....	....	5	4	3	5	....	2	3	1	....	....	....	....	1	....
Lodi	19	12	10	24	14	2	83	4,071	......	....	3	2	1	....	1	2	4	11	2	15	10	2	1	2	....	1	3	....	2	3
Midland	6	3	....	15	10	1	34	1,891	......	2	1	....	3	....	....	....	....	8	1	3	....	1	1	4	....	1	....	....	3	1
New Barbadoes	17	16	12	23	23	....	104	4,348	......	2	1	....	6	....	1	9	8	6	4	16	11	4	8	8	....	2	4	....	2	7
Palisade	4	5	4	7	6	....	26	2,302	......	....	....	....	2	....	....	....	5	1	3	3	2	1	....	1	....	4	....	....	....	....
Ridgefield	17	21	10	27	13	....	88	3,963	......	3	3	2	9	2	....	3	12	6	5	11	7	4	....	8	....	2	3	1	....	5
Ridgewood	4	7	5	9	6	....	31	1,478	......	2	2	....	3	....	....	....	2	6	2	4	2	....	....	2	....	....	....	....	....	3
Saddle River	3	3	2	6	7	....	21	1,356	......	....	1	....	2	....	....	....	....	....	2	4	1	1	2	2	....	....	....	....	....	1
Union	14	17	8	14	12	....	65	3,164	......	3	4	2	2	....	....	2	11	3	2	7	7	2	....	3	1	1	....	....	....	5
Washington	6	2	3	11	18	....	40	2,858	......	2	1	....	....	....	....	....	3	6	6	5	2	2	2	1	....	....	....	....	1	1
Totals	119	123	67	180	153	8	649	26,786	17.64	16	19	6	35	2	2	20	66	55	38	85	64	37	15	29	1	16	13	1	10	27

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

BURLINGTON COUNTY.

Population.................................55,408

Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bass River	4	3	3	6	7	1	23	1,006	......	....	1	....	....	....	1	....	4	1	2	4	1	....	1	4	....	....	....	....	....	1
Beverly City	6	2	3	8	7	1	27	1,759	......	....	....	....	1	....	....	....	4	3	6	1	....	1	1	1	....	1	....	....	....	1
Beverly Township	3	3	4	4	13	....	27	1,369	......	....	1	....	....	....	....	1	2	3	2	4	2	1	....	1	....	....	1	....	....	1
Bordentown	10	16	5	34	24	1	90	5,334	16.88	2	1	1	1	....	1	7	6	7	7	8	8	9	4	11	1	....	2	....	....	3
Burlington	34	16	28	46	51	4	166	7,237	22.94	5	3	....	1	....	....	11	15	17	19	15	8	11	7	12	....	3	4	....	1	4
Chester	7	2	....	8	18	1	36	2,656	......	1	....	....	....	....	....	....	4	1	1	4	3	....	3	6	....	2	3	....	1	....
Chesterfield	4	1	2	8	12	....	27	1,536	......	1	....	....	1	....	....	....	....	2	....	4	1	....	1	3	....	....	1	....	....	1
Cinnaminson	9	4	4	9	12	....	38	2,164	......	....	4	....	....	....	....	1	3	3	3	9	1	3	1	1	....	....	....	....	....	1
Delran	8	4	2	9	4	....	23	1,760	......	3	4	2	1	....	....	....	2	....	2	....	....	1	2	....	....	....	....	....	1	1
Evesham	8	3	5	5	10	....	31	1,603	......	....	2	....	1	....	....	....	5	3	2	5	5	3	1	1	....	1	1	....	....	....
Eastampton	4	....	3	1	1	....	9	666	......	....	....	....	....	....	....	....	1	....	1	....	1	....	....	1	....		....	....	....	1
Florence	2	6	1	4	5	....	18	1,539	......	1	....	....	....	....	....	1	2	....	1	2	1	....	1	2	1	....	....	....	....	2
Little Egg Harbor	8	4	1	5	16	....	34	1,351	......	....	1	....	....	....	....	1	5	2	2	2	4	1	1	4	....	1	....	....	....	1
Lumberton	1	3	....	6	2	....	12	1,669	......	....	1	....	....	....	....	1	1	2	....	1	1	1	....	....	....	1	....	....	....	1
Mansfield	9	....	1	5	2	....	17	1,648	......	....	4	....	....	....	1	....	5	....	....	1	....	....	....	1	....	....	2	....	....	....
Medford	6	5	1	7	11	....	30	1,960	......	....	....	....	....	....	1	3	....	1	4	7	1	1	3	1	....	1	4	....	....	1
Mount Laurel	7	2	1	5	4	....	19	1,739	......	....	....	....	....	....	....	....	4	....	4	1	2	1	....	1	....	....	....	....	....	....
New Hanover	9	4	6	6	13	....	38	2,573	......	....	3	....	....	....	2	....	3	2	5	4	2	5	1	2	1	2	....	....	1	....
Northampton	23	8	11	17	38	2	97	4,680	......	2	2	....	....	3	2	1	11	5	8	8	7	7	1	11	....	3	2	....	2	3
Pemberton	14	4	6	20	21	1	66	3,395	......	1	6	....	1	3	1	....	6	6	5	7	2	2	3	5	1	2	....	....	1	3
Randolph	2	2	1	3	1	....	9	439	......	....	1	....	....	....	....	2	1	....	1	1	1	....	....	1	....	1	....	....	....	....
Shamong	7	1	1	4	3	....	16	1,097	......	....	....	....	....	....	....	....	4	....	2	3	1	....	....	....	....	1	2	....	1	....
Southampton	2	3	1	13	10	....	29	2,309	......	....	2	....	1	1	....	....	1	4	4	3	1	2	....	2	....	1	....	....	....	2
Springfield	5	3	2	5	8	....	23	1,856	......	....	3	....	1	1	1	....	3	1	....	3	3	....	....	3	1	1	....	....	....	3
Washington	4	3	....	3	1	....	11	389	......	....	1	....	....	....	....	....	2	....	2	4	....	....	....	....	....	....	....	....	....	1
Westampton	1	2	....	1	2	....	6	715	......	....	....	....	....	....	....	....	3	....	....	1	....	....	....	2	....	....	....	....	....	....
Willingboro	6	4	3	3	3	1	20	743	......	1	1	....	2	....	1	....	2	1	....	3	....	....	....	1	....	....	....	....	1	1
Woodland	1	....	....	2	....	....	3	336	......	....	....	....	....	....	....	....	....	1	1	....	....	....	....	....	....	....	....	....	....	....
Totals	189	118	89	248	297	13	948	55,408	17.11	17.	40	3	11	7.	11	29	99	66	84	101	50	49	51	78	8	31	31	....	9	30

Death-rate per 1,000 in counties without cities of over 5,000 population, 16.16.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

CAMDEN COUNTY.

Population 62,942

Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrhœal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Camden City	264	168	113	391	186	13	1033	41,659	24.65	37	50	3	37	3	7	38	146	57	64	106	60	55	32	54	1	14	26	1	12	26
Centre	6	5	1	4	9	....	25	1,539	......	....	....	....	....	....	....	....	3	2	3	2	5	3	1	1	....	1	....	....	....	....
Delaware	6	3	....	10	7	....	26	1,481	......	....	2	....	....	....	....	....	6	1	4	1	....	1	....	4	....	1	....	....	....	....
Gloucester Township	16	6	5	16	17	....	60	2,627	......	1	2	....	2	....	1	....	5	7	4	6	6	2	....	8	....	1	....	....	....	1
Gloucester City	20	10	11	30	16	....	98	5,347	18.33	1	6	....	....	....	....	3	12	7	9	9	9	1	3	9	1	....	1	....	....	2
Haddon	11	7	1	13	19	....	51	2,651	......	2	....	....	....	....	1	1	4	3	5	5	9	5	1	4	....	1	1	....	3	1
Stockton	19	6	6	14	8	....	57	3,529	......	3	3	1	....	....	1	1	10	3	7	4	6	....	2	3	....	1	1	....	....	1
Waterford	7	4	4	4	5	....	24	2,149	......	....	1	....	1	....	....	5	3	....	3	2	2	....	....	3	....	3	....	....	....	....
Winslow	7	6	2	15	12	....	41	2,158	......	....	1	....	....	....	1	1	6	3	7	6	1	4	....	3	....	3	....	....	1	1
Totals	388	219	146	[illegible]	291	13	1404	62,942	23.30	33	65	3	40	3	11	48	194	81	106	139	110	81	39	89	2	23	28	1	16	33

Death rate per 1,000, without cities, 17.76.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

CAPE MAY COUNTY.

Population................................9,765

Statistical Divisions.	Deaths at all ages: Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.	Principal causes of death: Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Cape May City	8	5	1	6	3	1	24	1,698	......	....	....	....	1	....	....	....	3	1	....	1	6	2	2	1	....	....	....	....	....	....
Dennis	6	3	2	12	8	....	31	1,813	......	....	1	....	....	1	....	....	....	3	3	7	....	....	....	4	....	....	2	....	1	1
Lower	6	2	7	6	7	1	29	1,977	......	....	6	....	....	1	....	....	3	3	2	1	3	2	....	1	....	....	....	....	....	1
Middle	3	3	3	4	9	....	22	2,575	......	2	3	....	1	....	....	....	1	1	2	2	1	....	....	2	....	....	....	....	....	1
Upper	6	2	2	4	12	2	28	1,702	......	....	....	....	....	....	....	....	2	2	2	....	2	1	1	3	....	1	2	....	....	1
Cape May Point*	....	....	....	....	....	....	....	......	......	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Totals	29	15	15	32	39	4	134	9,765	13.72	2	10	....	2	2	....	....	9	10	9	11	12	5	3	11	....	1	4	....	1	4

* Population and return are included in the lower township.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending July 1st, 1882.

CUMBERLAND COUNTY.

Population.................................37,687

Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.
Bridgeton	57	39	26	47	45	5	208	8,722	23.85
Commercial	10	7	3	11	11	....	41	2,265	......
Deerfield	3	2	2	5	3	....	15	1,643	......
Downe	6	8	....	3	8	....	24	1,087	......
Fairfield	14	5	3	10	11	1	41	2,316	......
Greenwich	3	4	4	3	5	....	18	1,945	......
Hopewell	3	3	1	7	17	....	31	1,754	......
Landis	16	31	8	23	28	1	107	6,035	......
Maurice River	9	7	2	16	14	....	48	2,274	......
Millville	36	22	24	41	28	1	125	7,660	17.75
Stoe Creek	3	1	1	4	10	....	21	1,107	......
Totals	138	118	82	169	185	8	690	37,687	18.31

Statistical Divisions.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrhœal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bridgeton	2	12	....	1	....	2	43	14	14	12	15	16	10	4	11	1	7	1	....	1	10
Commercial	....	4	....	....	....	1	....	5	3	2	4	3	3	1	6	....	....	....	....	....	2
Deerfield	....	....	....	1	....	....	1	....	....	2	....	2	1	....	1	1	....	1	....	....	1
Downe	....	2	....	1	....	2	....	8	3	1	1	2	1	1	1	....	1	....	....	....	1
Fairfield	....	3	....	....	....	1	3	5	4	3	2	2	2	....	1	....	4	....	1	....	....
Greenwich	....	....	....	1	....	....	....	4	2	2	....	1	1	....	3	....	1	....	....	....	....
Hopewell	....	....	....	....	....	....	....	4	3	3	3	....	3	4	6	....	1	....	....	....	1
Landis	....	5	....	3	....	....	10	5	9	11	4	10	6	3	6	....	4	1	....	2	....
Maurice River	....	3	....	....	....	1	3	4	2	3	6	4	1	1	3	1	2	1	....	1	....
Millville	....	26	....	1	....	....	3	19	8	15	6	12	3	6	7	....	4	....	....	2	3
Stoe Creek	....	....	....	....	....	....	1	1	2	2	1	1	....	2	3	....	2	....	....	....	1
Totals	2	55	....	8	....	7	64	64	50	57	42	56	33	22	47	3	26	4	1	6	19

Death rate per 1,000, without cities, 20.94.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

ESSEX COUNTY.

Population.................................189,929

Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous disease.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases of children.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Belleville	19	10	7	16	14	....	66	3,004	......	3	1	....	4	....	3	1	7	6	3	5	8	3	1	4	....	2	8	1	....	2
Bloomfield	17	16	12	19	18	....	82	5,748	......	3	....	....	11	....	....	5	5	7	6	7	4	4	4	5	....	3	....	....	....	1
Caldwell	11	9	3	8	14	....	45	3,167	......	....	....	....	5	1	....	3	6	4	1	7	1	2	1	4	....	....	....	....	....	....
Clinton	12	6	3	6	5	....	29	2,742	......	....	....	....	2	....	....	5	4	2	6	8	6	1	....	2	....	1	1	....	....	....
East Orange	22	31	15	23	26	1	114	9,349	13.66	9	5	....	16	....	4	5	11	7	6	6	5	5	6	5	....	6	3	....	....	3
Franklin	5	....	2	11	12	....	30	1,617	......	....	....	....	1	....	....	....	3	9	6	4	....	1	4	5	1	2	9	....	....	2
Livingston	3	3	3	2	9	....	19	1,401	......	....	....	....	....	....	....	4	....	....	1	1	....	2	1	3	....	2	....	....	....	1
Millburn	4	5	6	10	7	....	32	1,742	......	....	....	....	....	....	....	5	3	4	2	1	3	1	2	5	....	1	....	....	1	....
Montclair	26	17	13	37	31	....	101	5,147	......	2	3	....	4	....	1	14	11	4	5	10	6	4	3	5	....	5	2	....	3	1
Newark	871	969	448	1096	522	16	3912	136,508	26.66	48	97	19	310	60	47	309	374	299	282	490	377	151	128	189	10	81	56	6	28	76
Orange	53	86	44	84	39	1	326	13,207	25.44	3	5	....	28	....	8	37	34	27	17	36	25	12	11	13	1	6	5	....	7	6
South Orange	16	9	12	17	15	1	68	3,911	......	....	1	....	9	3	1	8	6	2	2	4	1	5	6	3	....	6	2	....	....	1
West Orange	19	16	6	11	17	....	68	3,385	......	....	....	....	11	....	....	3	7	8	3	5	9	1	8	4	....	8	....	....	1	1
Totals	1107	1164	678	1285	717	19	4911	189,929	26.86	63	112	19	401	64	68	401	474	356	319	551	457	189	180	242	12	118	76	7	44	94

Death-rate per 1,000, without cities, 17.23.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending July 1st, 1882.

GLOUCESTER COUNTY. Population .... 26,886. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.
Clayton	10	2	3	9	9	....	33	1,951	......
Deptford	11	1	1	4	5	....	22	1,520	......
East Greenwich	7	2	....	6	4	1	20	......	......
Franklin	7	5	1	12	9	....	34	2,480	......
Glassboro	12	10	11	19	15	....	65	2,098	......
Greenwich	4	2	3	12	4	....	25	2,398	......
Harrison	15	6	4	12	17	....	53	2,841	......
Logan	7	....	1	1	11	....	20	1,765	......
Mantua	9	1	3	7	8	....	28	1,718	......
Monroe	7	....	1	7	11	....	26	1,866	......
Washington	6	3	2	11	7	....	31	1,386	......
West Deptford	5	5	2	7	4	....	23	1,399	......
Woodbury	12	4	2	18	14	1	47	2,346	......
Woolwich	10	4	7	8	14	1	44	1,974	......
Totals	126	44	41	129	129	3	471	26,886	18.19

PRINCIPAL CAUSES OF DEATH.

Statistical Divisions.	Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Clayton	....	1	2	....	....	....	1	6	3	5	1	4	1	....	....	....	3	1	....	....	1
Deptford	1	2	1	....	....	1	....	2	1	....	2	1	1	1	2	....	....	....	....	....	1
East Greenwich	....	1	....	....	....	....	....	6	1	....	1	....	....	1	3	....	....	2	....	....	....
Franklin	....	1	....	1	....	....	1	2	6	4	3	3	3	1	1	....	....	....	....	1	....
Glassboro	2	3	2	1	....	....	2	4	5	8	7	9	....	1	4	....	1	1	....	....	2
Greenwich	....	4	....	....	....	1	....	4	1	1	2	....	1	3	2	....	2	....	....	....	2
Harrison	....	....	....	2	....	2	2	9	2	10	5	....	1	....	3	....	3	2	....	....	....
Logan	....	1	....	....	....	....	1	4	....	1	3	1	....	....	1	....	1	1	....	1	....
Mantua	....	5	....	....	....	....	1	3	3	3	3	1	....	....	....	1	....	....	....	1	1
Monroe	....	1	....	....	....	....	....	5	4	3	3	1	3	1	1	....	....	....	1	....	....
Washington	1	3	....	....	....	....	1	3	2	1	3	2	4	1	5	....	1	....	....	1	1
West Deptford	....	1	....	....	....	....	1	6	3	1	2	3	3	....	2	....	....	....	....	....	1
Woodbury	....	....	....	1	....	1	1	3	2	6	5	6	4	1	4	....	....	....	....	1	3
Woolwich	1	....	....	4	....	2	....	6	3	1	5	3	6	1	1	....	3	....	....	1	1
Totals	5	21	5	9	....	8	11	61	33	43	46	32	26	10	29	1	13	8	1	6	13

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

HUDSON COUNTY.

Population 187,944

Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.
Bayonne	73	63	26	74	18	....	252	9,372	26.89	6	9	....	11	1	1
Guttenberg	10	11	1	6	5	....	33	1,206	......	2	....	....	4	....	....
Harrison	35	36	19	62	17	1	170	6,898	24.64	7	6	....	10	1	2
Hoboken	264	233	105	286	93	..	974	30,999	31.42	13	27	25	41	6	8
Jersey City	908	774	450	1121	377	6	3636	120,722	30.12	[illegible]	136	209	165	56	26
Kearny	7	3	6	16	1	..	35	777	......	....	....	1	....	....	....
North Bergen	43	19	34	121	65	1	313	4,[illegible]	72.[illegible]	16	20	25	5	1	1
Town of Union	50	56	40	48	19	....	216	6,049	26.[illegible]	2	3	4	14	1	....
Union Township	7	10	4	9	3	1	34	1,310	......	3	....	1	3	1	....
Weehawken	13	9	6	7	5	1	40	1,102	......	1	1	....	2	....	....
West Hoboken	39	28	19	52	19	..	127	5,441	28.17	5	4	2	21	2	5
Totals	1486	1339	712	1799	642	10	5640	187,944	31.07	96	235	277	285	70	46

Statistical Divisions.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bayonne	18	31	5	11	50	26	4	7	9	..	6	1	....	2	16
Guttenberg	4	6	2	1	2	3	4	....	....	..	....	....	....	....	1
Harrison	5	16	17	13	23	26	5	3	4	..	1	1	2	1	4
Hoboken	118	131	69	60	91	96	40	34	24	2	11	10	1	11	32
Jersey City	224	417	251	218	413	311	120	61	137	15	106	37	4	29	147
Kearny	3	9	1	1	6	3	3	....	2	..	1	....	....	1	6
North Bergen	7	34	40	20	19	13	8	16	21	..	3	....	....	1	5
Town of Union	47	35	9	10	10	31	8	6	6	..	5	2	....	3	3
Union Township	6	1	3	3	5	1	2	3	....	..	....	....	....	1	....
Weehawken	3	9	3	2	4	3	1	....	1	..	1	....	....	....	5
West Hoboken	10	15	9	4	16	17	4	3	6	1	4	3	1	....	3
Totals	443	698	381	336	609	528	198	131	210	18	141	53	8	49	225

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending July 1st, 1882.

HUNTERDON COUNTY.

Population 36,570

Statistical Divisions.	Deaths at all ages: Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.
Alexandria	1	1	....	6	14	....	22	1,834	......
Bethlehem	7	6	6	13	23	2	55	2,880	......
Clinton Township	7	2	....	9	19	....	37	2,188	......
Delaware	3	1	3	11	22	....	40	3,092	......
East Amwell	6	2	....	4	14	....	26	1,696	......
Franklin	2	....	....	4	3	....	9	1,838	......
Frenchtown	1	3	4	4	10	....	22	1,089	......
High Bridge	10	3	4	14	9	....	36	2,209	......
Holland	2	1	....	9	6	....	18	1,886	......
Kingwood	3	1	....	3	11	1	18	1,694	......
Lambertville	17	4	7	16	25	2	69	4,183	......
Lebanon	12	3	3	13	16	....	47	2,689	......
Raritan	12	3	4	10	24	1	54	4,188	......
Readington	5	5	3	12	24	....	52	3,106	......
Tewksbury	4	3	2	2	15	....	27	2,108	......
Town of Clinton	3	1	1	2	3	....	10	842	......
Union	3	2	3	2	5	....	14	1,168	......
West Amwell	2	1	2	5	3	....	14	1,059	......
Totals	108	41	40	136	244	6	570	36,570	14.77

PRINCIPAL CAUSES OF DEATH.

Statistical Divisions.	Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Alexandria	....	1	....	....	....	1	....	....	2	....	4	....	2	3	5	....	....	....	....	....	....
Bethlehem	....	5	....	3	....	1	....	3	5	5	3	3	6	3	6	1	1	2	....	....	5
Clinton Township	....	1	....	2	....	2	....	1	2	4	2	1	5	....	6	....	....	2	....	1	3
Delaware	....	1	....	....	1	....	1	....	3	2	1	2	3	5	10	....	1	1	....	....	2
East Amwell	....	....	....	....	....	1	....	4	1	1	2	1	4	....	4	....	1	2	....	....	1
Franklin	....	....	....	....	....	....	....	....	....	1	....	....	2	1	2	....	....	1	....	....	....
Frenchtown	1	1	....	4	....	....	....	2	....	2	....	....	2	....	1	....	2	1	....	....	....
High Bridge	2	1	....	....	....	....	1	5	1	2	5	2	3	....	2	1	....	....	....	2	....
Holland	2	3	1	....	....	....	....	....	1	1	2	1	2	1	1	....	....	....	....	2	....
Kingwood	....	....	....	....	1	....	....	2	....	1	2	....	2	....	8	....	1	1	....	....	2
Lambertville	1	....	....	....	....	....	2	7	6	7	9	1	2	2	7	....	2	2	....	....	3
Lebanon	2	3	....	2	....	....	....	5	7	1	4	4	2	1	4	....	2	3	1	2	1
Raritan	....	2	....	1	1	....	....	7	....	3	6	3	5	6	6	....	....	2	1	....	1
Readington	....	2	....	2	....	....	1	4	5	2	4	3	4	4	6	....	2	2	....	....	2
Tewksbury	....	2	....	....	....	....	1	1	....	3	2	1	6	2	1	2	....	....	....	....	1
Town of Clinton	....	....	....	1	....	....	....	1	1	....	1	....	3	....	....	....	....	....	....	....	....
Union	1	1	....	1	....	1	....	2	....	1	3	....	2	....	1	....	....	....	....	....	....
West Amwell	....	1	....	....	....	....	....	3	....	2	....	1	2	....	....	....	....	1	....	1	....
Totals	9	24	1	15	3	6	6	47	26	30	54	22	55	26	65	4	14	20	2	8	21

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending July 1st, 1882.

MERCER COUNTY.

Population..........58,061

Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M	Consumption. F	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Chambersburg	46	21	19	27	18	3	136	5,437	25.01	2	6	....	4	....	4	8	21	7	8	22	9	5	1	5	....	5	1	....	....	3
East Windsor	3	4	1	17	14	2	41	2,271	......	1	2	1	....	4	....	....	1	3	2	5	2	4	1	5	....	3	2	....	....	3
Ewing	4	1	....	51	29	....	85	2,412	......	....	3	....	....	....	....	....	1	12	4	4	....	4	2	20	3	5	....	....	....	2
Hamilton	11	7	5	29	24	2	78	3,370	......	3	1	....	....	....	....	3	9	17	3	4	1	7	1	9	1	1	2	....	1	....
Hopewell	16	12	10	17	22	1	77	4,463	......	....	1	....	2	2	1	6	8	3	7	2	4	4	2	12	....	4	2	....	....	1
Lawrence	13	10	4	21	7	....	55	3,174	......	3	1	....	1	....	....	2	7	4	5	5	3	2	....	3	....	1	1	....	1	4
Millham	1	....	....	....	2	....	3	......	......	....	....	....	....	....	1	....	....	1	....	....	....	....	....	....	....	....	1	....	....	....
Princeton	24	12	9	17	23	....	85	4,348	......	1	2	1	1	....	1	3	6	7	7	6	9	1	3	6	....	5	3	....	....	1
Trenton	141	76	53	216	107	21	614	29,910	20.53	8	20	17	....	5	3	21	75	[illegible]	67	60	32	25	14	29	5	12	9	3	1	22
Washington	1	1	....	7	8	....	17	1,281	......	....	1	....	....	....	1	....	....	2	....	....	....	....	....	4	....	....	1	....	1	3
West Windsor	4	1	1	3	9	....	18	1,396	......	....	....	....	2	....	....	....	....	....	1	....	2	....	2	5	1	....	....	....	1	....
Totals	265	145	102	405	263	29	1209	58,061	20.82	18	37	19	10	11	11	43	126	115	102	119	62	58	26	109	10	36	22	3	5	37

Death-rate per 1,000, without cities, 20.21.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

MIDDLESEX COUNTY.

Population 52,286

Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Cranbury	7	3	3	10	7	....	29	1,899	......	....	1	....	....	....	....	....	3	2	4	5	1	2	2	1	....	1	1	1	1	1
East Brunswick	17	5	5	15	13	3	67	3,372	......	....	2	....	7	....	1	3	7	1	2	5	1	6	2	7	1	3	1	....	2	1
Madison	5	2	3	5	7	....	21	1,063	......	1	1	1	....	....	....	1	3	2	1	3	1	....	....	1	....	1	1	....	....	2
Monroe	5	1	5	15	15	....	41	3,017	......	....	2	....	....	....	....	....	4	4	3	5	1	2	3	5	....	1	....	....	....	2
New Brunswick	98	57	49	113	75	4	[illegible]	17,166	23.76	4	12	9	20	....	4	14	46	20	27	36	30	14	15	17	3	11	12	1	1	12
North Brunswick	4	1	...	4	10	....	14	1,351	......	....	1	....	....	....	....	....	2	1	....	5	....	1	2	1	....	....	....	....	....	....
Perth Amboy	37	29	13	50	14	2	134	4,808	......	4	3	1	5	....	3	3	20	4	13	9	16	6	....	7	....	4	1	3	1	7
Piscataway	5	8	6	14	21	....	54	3,242	......	1	3	....	....	....	....	3	3	3	....	8	1	4	1	6	....	2	....	....	....	2
Raritan	9	5	10	17	18	1	60	3,769	......	....	3	....	....	....	....	4	2	3	6	6	3	3	4	5	....	1	1	....	....	6
Sayreville	7	6	1	9	3	....	26	1,930	......	....	1	....	1	1	....	3	5	....	....	8	2	....	....	1	....	1	....	....	1	2
South Amboy	18	16	7	37	13	....	91	3,645	......	2	....	....	6	....	....	4	6	7	5	7	3	4	1	5	....	4	3	....	2	12
South Brunswick	5	3	1	8	19	1	37	2,908	......	....	1	....	1	....	....	....	3	8	2	3	....	2	1	2	....	4	2	....	....	....
Woodbridge	26	12	9	22	16	....	85	4,099	......	1	3	....	3	....	....	6	11	8	7	9	5	2	2	3	....	....	....	1	3	3
Totals	236	151	113	311	231	11	1065	52,286	20.18	15	33	11	43	1	8	45	110	87	80	104	64	45	33	61	4	33	23	5	10	50

Death rate per 1,000, without cities, 18.91.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

MONMOUTH COUNTY.

Population....55,538

Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.
Atlantic	4	6	4	9	8	....	31	1,743	....
Eatontown	15	7	1	10	12	....	45	2,642	....
Freehold	12	5	11	25	25	1	76	4,303	....
Holmdel	3	....	1	8	4	....	16	1,575	....
Howell	15	6	4	20	17	2	64	3,874	....
Manalapan	4	1	1	6	13	5	30	2,175	....
Marlboro	3	4	4	9	6	....	27	2,125	....
Matawan	11	14	9	22	17	....	73	2,669	....
Middletown	15	11	7	30	30	....	93	6,069	....
Millstone	8	1	1	8	9	....	27	2,080	....
Neptune	54	22	18	49	31	4	178	4,187	....
Ocean	39	21	12	40	28	5	145	5,157	....
Raritan	16	9	6	25	25	2	84	5,191	....
Shrewsbury	23	13	15	38	34	2	125	6,526	....
Upper Freehold	8	....	5	20	26	....	59	3,236	....
Wall	21	10	5	37	19	2	87	3,829	....
Totals	250	135	106	387	306	25	1158	55,538	20.76

Statistical Divisions.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrhoeal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Atlantic	1	1	2	5	....	....	1	1	4	1	2	3	1	2	3	....	....	....	....	....	....
Eatontown	1	2	....	3	....	....	1	7	1	2	4	3	7	2	4	....	1	1	....	....	2
Freehold	1	....	1	3	....	3	1	8	5	8	11	4	8	4	13	1	4	1	....	1	1
Holmdel	....	....	....	....	....	....	....	1	3	1	3	1	1	1	2	....	....	....	....	....	....
Howell	....	4	....	1	....	....	....	9	3	2	4	6	3	3	13	....	4	....	....	....	2
Manalapan	....	....	....	....	....	1	....	....	1	2	2	2	4	2	5	....	1	....	1	....	....
Marlboro	....	2	....	1	....	....	2	3	....	2	3	1	3	3	2	....	2	....	....	....	....
Matawan	1	3	....	2	....	2	7	7	7	7	8	6	....	5	3	....	2	3	1	....	3
Middletown	1	....	1	4	1	....	3	6	3	4	7	5	10	6	6	....	3	2	....	....	3
Millstone	....	1	....	....	....	....	....	1	1	3	6	1	1	1	1	....	....	1	....	....	3
Neptune	3	1	....	12	2	3	3	35	9	6	18	15	11	4	10	....	8	1	....	1	10
Ocean	1	3	....	6	....	2	5	22	6	5	21	7	9	6	13	1	6	1	1	1	9
Raritan	....	2	1	3	....	....	4	9	9	5	8	2	3	3	6	2	2	3	1	....	4
Shrewsbury	....	3	....	2	....	....	3	12	5	6	8	10	7	6	16	....	9	3	1	....	4
Upper Freehold	....	1	....	....	....	1	....	2	5	12	3	....	3	1	5	....	2	2	....	....	....
Wall	....	3	....	....	....	....	6	10	4	3	9	2	5	4	10	....	6	2	....	2	1
Totals	9	34	5	40	3	11	33	130	66	73	113	65	76	61	114	4	43	19	6	5	41

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

MORRIS COUNTY.

Population 50,861

DEATHS AT ALL AGES.

Statistical Divisions.	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.
Boonton	9	4	6	15	17	....	51	2,061	......
Chatham	15	10	6	27	26	1	85	4,276	......
Chester	14	3	4	14	12	....	47	2,327	......
Hanover	7	6	7	57	46	3	126	4,139	......
Jefferson	9	5	3	10	6	....	33	1,792	......
Mendham	2	1	1	10	10	....	24	1,596	......
Montville	7	4	3	11	14	....	39	1,370	......
Morristown	28	15	13	41	29	1	121	6,837	17.70
Mount Olive	9	6	3	11	7	1	36	1,884	......
Passaic	7	1	3	8	11	1	30	1,995	......
Pequannock	4	15	16	11	6	1	54	2,289	......
Randolph	30	23	26	31	19	3	136	7,700	......
Rockaway	27	33	28	33	24	....	143	7,806	......
Roxbury	10	7	3	10	3	....	33	2,139	......
Washington	9	6	3	13	6	....	34	2,661	......
Totals	177	147	138	303	226	10	990	50,861	19.64

PRINCIPAL CAUSES OF DEATH.

Statistical Divisions.	Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Boonton	1	2	....	3	....	....	5	1	2	5	4	1	4	3	3	....	2	....	....	....	1
Chatham	3	4	....	7	....	2	6	4	9	6	8	4	6	4	3	....	3	....	....	4	2
Chester	1	1	....	....	....	....	1	7	2	2	5	1	3	1	1	....	1	1	....	1	4
Hanover	4	1	....	1	....	....	7	3	7	7	18	2	6	4	30	....	3	....	....	1	....
Jefferson	....	....	....	....	....	....	2	1	1	3	2	2	5	....	2	1	1	....	....	....	4
Mendham	1	....	....	....	....	....	....	2	3	3	2	1	....	1	3	....	3	1	....	....	....
Montville	....	5	....	....	....	....	3	3	1	4	4	2	1	2	5	....	....	1	1	....	....
Morristown	3	....	....	3	....	....	8	15	12	10	9	9	7	6	8	....	2	4	1	....	4
Mount Olive	1	....	....	3	1	....	1	6	2	4	2	4	3	....	2	....	....	3	....	....	3
Passaic	....	....	....	1	....	....	1	4	1	2	7	2	1	....	1	....	3	....	....	....	....
Pequannock	2	....	....	15	....	....	6	2	1	2	4	3	4	4	2	....	....	....	....	1	....
Randolph	5	2	....	21	....	3	9	13	6	8	17	14	7	2	6	....	2	5	....	3	7
Rockaway	2	6	....	26	....	1	2	9	3	6	34	12	4	6	4	....	4	2	....	....	10
Roxbury	....	3	....	6	....	1	2	3	1	1	2	3	3	1	1	....	1	1	....	....	....
Washington	1	2	....	1	....	....	....	4	2	....	2	1	2	1	4	....	3	....	....	....	3
Totals	21	26	....	86	1	7	50	76	52	68	120	61	57	33	66	1	35	15	2	10	38

Death-rate per 1,000, without cities, 19.94.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending July 1st, 1882.

OCEAN COUNTY. Population.....14,455 Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases	Erysipelas.	Digestive and intestinal diseases.	Cancer	Acute rheumatism.	Puerperal.	Accident.
Berkley	3	1	....	2	3	....	9	658	......	....	....	....	....	....	....	....	....	....	1	1	1	1	....	1	1	2	....	....	....	....
Brick	6	7	2	14	7	1	37	2,990	......	....	2	....	....	1	1	....	3	....	7	4	5	1	....	3	....	....	1	1	1	....
Dover	8	1	3	11	8	1	32	2,439	......	....	2	....	....	....	....	4	1	4	5	4	1	2	....	1	....	1	....	....	....	1
Eaglewood	2	1	2	5	4	....	14	562	......	....	....	....	....	....	....	....	....	1	3	....	3	1	1	....	....	....	....	2	....	....
Jackson	2	1	1	9	4	....	17	1,808	......	....	1	....	....	....	....	....	2	2	2	1	....	2	....	2	....	1	1	....	....	1
Lacey	4	1	4	6	1	....	16	814	......	....	1	....	....	....	....	4	....	1	2	1	1	1	....	1	....	1	....	....	....	....
Manchester	5	2	5	4	2	....	18	1,057	......	....	1	....	1	....	....	3	2	2	1	1	2	....	....	2	....	1	....	....	1	....
Ocean	3	2	....	4	2	....	11	464	......	....	....	....	....	....	....	....	....	....	....	1	2	1	....	1	....	....	....	....	1	....
Plumsted	13	....	....	9	6	....	28	1,561	......	....	1	....	....	....	1	2	5	4	2	2	2	3	....	....	....	....	1	....	....	....
Stafford	2	....	1	8	7	1	19	1,068	......	....	1	....	....	....	....	....	....	3	3	....	1	1	....	2	....	....	....	....	....	....
Union	7	....	....	7	4	....	18	1,034	......	....	1	....	....	....	....	....	3	2	3	1	1	....	....	....	....	4	....	....	....	....
Totals	55	16	18	79	48	3	219	14,455	15.15	....	10	....	1	1	2	13	16	19	29	16	19	13	1	13	1	10	3	3	3	2

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending July 1st, 1882.

PASSAIC COUNTY. Population.....68,860	DEATH AT ALL AGES.									PRINCIPAL CAUSES OF DEATH.																				
Statistical Divisions.	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.	Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Aquackanonck	8	4	3	3	7	1	21	1,781	......	....	....	....	3	....	....	1	1	2	....	4	1	....	....	1	....	1	3	....	....	1
Little Falls	6	8	6	10	7	....	37	1,404	......	....	1	....	5	....	....	1	3	2	2	2	4	3	....	5	....	1	....	....	2	2
Manchester	5	1	2	9	4	....	21	1,518	......	....	1	....	....	....	....	....	1	1	3	3	2	1	....	1	....	3	....	....	....	1
Passaic City	47	28	17	32	24	1	149	6,532	22.82	3	9	....	6	....	4	3	24	5	18	19	16	7	4	6	1	3	....	....	2	7
Paterson	417	260	150	463	221	....	1511	51,031	19.61	24	49	3	101	3	10	37	232	106	117	178	108	57	51	52	6	63	19	5	12	31
Pompton	13	10	7	9	6	1	46	2,251	......	2	....	....	7	....	....	4	5	1	2	2	2	3	2	3	....	2	1	....	....	....
Wayne	3	2	3	6	4	....	17	1,757	......	....	....	....	3	....	....	1	2	3	1	....	2	....	....	....	....	....	....	....	....	1
West Milford	6	9	10	8	11	1	45	2,591	......	1	1	....	10	....	....	6	1	2	1	2	1	3	1	5	....	2	....	1	....	2
Totals	500	323	197	540	284	4	1847	68,860	26.82	30	61	3	134	3	14	53	269	128	138	208	136	73	56	74	7	78	23	6	16	45

Death-rate per 1,000, without cities, 16.56.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

SALEM COUNTY.

Population....................24,579

Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Elsinboro	2	....	....	2	1	....	5	670	......	....	....	....	....	....	....	....	1	1	....	....	....	....	....	1	....	1	....	....	....	....
Lower Alloways Creek	4	....	1	4	5	....	14	1,373	......	....	1	....	....	....	....	....	1	1	....	....	....	....	....	2	....	4	1	....	....	....
Lower Penn's Neck	7	1	4	3	9	....	24	1,334	......	....	....	....	....	....	....	1	3	[illegible]	[illegible]	4	....	4	....	2	....	....	....	....	....	....
Mannington	12	11	3	16	17	....	59	2,280	......	2	2	....	....	....	4	2	1	[illegible]	[illegible]	7	1	[illegible]	1	6	1	1	....	....	....	1
Oldmans	4	4	2	2	4	1	17	......	......	....	1	....	2	....	1	....	2	1	1	....	1	....	....	1	....	1	....	....	1	....
Pilesgrove	10	9	8	18	21	1	67	3,497	......	....	5	....	1	....	4	4	....	[illegible]	[illegible]	6	4	4	....	3	....	5	2	1	....	1
Pittsgrove	8	12	6	8	8	....	44	1,778	......	....	2	....	....	....	1	10	5	[illegible]	1	4	[illegible]	[illegible]	1	4	....	....	2	....	....	1
Quinton	3	4	3	4	5	1	20	1,890	......	....	....	....	....	1	....	1	2	1	[illegible]	....	[illegible]	1	[illegible]	....	1	1	....	....	1	....
Salem	19	11	10	25	32	2	99	5,056	19.66	3	5	....	1	....	....	2	6	[illegible]	12	7	7	4	[illegible]	9	....	....	6	....	1	1
Upper Alloways Creek	2	3	3	7	14	....	28	1,917	......	....	....	....	1	....	....	3	1	[illegible]	4	1	....	[illegible]	....	3	....	1	1	....	1	1
Upper Penn's Neck	11	5	7	7	8	4	42	3,261	......	....	1	....	2	....	....	1	5	1	4	6	[illegible]	[illegible]	....	2	....	3	1	....	....	3
Upper Pittsgrove	9	5	1	8	13	....	36	2,073	......	....	5	....	....	....	3	3	3	4	....	[illegible]	....	1	....	3	1	....	....	....	....	....
Totals	91	64	50	104	137	9	455	24,579	18.51	5	22	....	7	1	12	27	30	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6	36	3	17	13	1	4	8

Death-rate per 1,000, without cities, 18.24.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

SOMERSET COUNTY. Population.....27,162. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrhœal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bedminster	9	6	4	10	11	....	40	1,612	......	2	....	....	2	....	....	....	6	....	3	1	4	2	....	9	....	3	3	....	....	1
Bernards	11	6	3	14	13	....	47	2,023	......	2	1	....	1	....	....	3	9	1	1	7	2	1	2	6	1	4	....	....	3	....
Branchburg	4	2	1	7	10	....	24	1,316	......	1	....	....	....	....	....	....	1	....	2	1	2	1	3	5	....	2	1	....	....	....
Bridgewater	34	18	22	34	43	3	154	7,407	......	7	4	....	4	2	....	9	12	4	7	13	11	13	4	15	1	9	....	....	5	8
Franklin	14	6	6	17	27	3	73	3,516	......	3	2	....	....	1	1	5	5	2	5	10	4	6	4	4	..	10	2	....	1	3
Hillsborough	9	2	5	18	17	1	52	3,248	......	1	....	....	....	1	....	5	1	2	4	9	6	10	1	1	1	3	2	....	....	1
Montgomery	4	6	1	4	13	....	28	1,998	......	....	....	....	....	....	1	1	3	1	3	2	2	1	2	6	....	....	2	1	....	....
North Plainfield	12	4	12	15	17	....	60	3,217	......	....	1	....	3	1	1	2	4	3	5	9	....	2	2	3	3	2	....	....	....	5
Warren	2	4	6	10	4	....	26	1,304	......	....	4	....	....	....	....	1	2	4	3	1	3	3	1	2	....	1	....	....	....	1
Totals	99	58	64	129	155	7	504	27,162	18.55	16	12	....	10	6	3	23	43	17	33	53	34	41	19	51	6	34	10	1	9	19

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending July 1st, 1882.

SUSSEX COUNTY.

Population........................23,539

Statistical Divisions.	Deaths at all ages: Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.
Andover	3	4	4	5	10	....	26	1,150	......
Byram	5	5	1	3	11	....	24	1,445	......
Frankford	4	3	3	7	8	1	26	1,682	......
Green	....	....	....	3	1	....	4	737	......
Hardyston	13	12	11	14	18	2	70	2,645	......
Hampton	1	7	1	2	1	1	13	896	......
Lafayette	2	....	....	8	8	....	18	781	......
Montague	4	....	....	5	6	....	15	1,053	......
Newton	10	16	10	19	5	4	64	2,613	......
Sandyston	....	2	4	3	11	2	22	1,196	......
Sparta	10	6	5	11	8	3	43	2,274	......
Stillwater	3	6	3	13	14	1	39	1,609	......
Vernon	2	4	4	7	12	....	30	1,811	......
Wallpack	....	....	2	2	....	....	4	675	......
Wantage	6	8	6	13	21	....	54	3,361	......
Totals	63	73	54	116	135	14	455	23,539	19.33

Statistical Divisions.	Principal causes of death: Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.
Andover	2	1	....	1	....	....	....	5	1	1	3
Byram	....	3	....	....	1	....	2	4	....	....	3
Frankford	....	....	....	4	....	....	2	1	1	2	1
Green	....	....	....	1	....	....	....	....	....	....	....
Hardyston	2	1	....	12	....	....	4	2	1	1	12
Hampton	....	....	....	3	....	....	6	....	....	....	....
Lafayette	....	....	....	....	....	....	....	....	1	1	3
Montague	....	....	....	....	....	....	....	1	....	1	1
Newton	....	3	....	10	....	....	6	7	3	4	3
Sandyston	....	....	....	3	....	....	....	1	2	2	2
Sparta	1	1	....	1	....	....	....	5	5	6	2
Stillwater	2	3	....	6	....	....	2	2	1	3	3
Vernon	1	....	....	1	....	....	3	....	2	5	2
Wallpack	....	2	....	....	....	....	....	....	....	....	....
Wantage	1	3	....	2	1	....	1	4	4	3	6
Totals	9	17	....	44	2	....	26	32	21	26	39

Statistical Divisions.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Andover	3	3	1	6	....	1	....	....	....	1
Byram	2	....	....	3	....	3	....	....	....	2
Frankford	1	3	....	1	....	1	....	....	....	2
Green	....	1	....	....	....	....	1	....	....	1
Hardyston	5	7	2	3	....	4	2	....	....	4
Hampton	....	....	....	1	1	....	....	....	....	....
Lafayette	....	3	1	1	....	....	....	....	1	2
Montague	....	1	3	....	1	1	....	....	1	....
Newton	7	7	4	3	....	1	....	....	2	1
Sandyston	....	....	2	3	....	1	2	....	....	....
Sparta	3	1	3	2	....	2	....	....	1	1
Stillwater	1	4	1	1	1	3	....	....	....	1
Vernon	1	1	....	2	....	6	1	....	....	....
Wallpack	....	....	....	....	....	....	....	....	1	....
Wantage	1	3	5	4	....	1	2	....	1	1
Totals	23	33	21	27	3	23	8	....	7	16

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending July 1st, 1882.

UNION COUNTY.

Population 55,571

Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.
Clark	2	....	....	3	3	....	9	263	......
Cranford	3	2	1	3	1	....	10	1,184	......
Elizabeth	148	131	74	165	91	3	612	28,229	21.68
Fanwood	4	2	3	2	6	....	17	1,167	......
Linden	8	7	1	18	11	....	45	1,880	......
New Providence	7	....	....	10	3	1	21	751	......
Plainfield	24	30	20	30	47	....	151	8,125	18.58
Rahway	32	27	20	46	45	....	170	6,455	26.33
Springfield	1	2	1	3	3	....	10	944	......
Summit	10	7	2	16	6	....	41	1,910	......
Union	6	2	1	8	9	....	27	2,418	......
Westfield	10	12	6	19	11	1	58	2,316	......
Totals	255	222	130	318	236	5	1177	55,571	21.18

Statistical Divisions.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Clark	....	....	....	....	....	....	....	....	....	....	1	1	....	....	1	....	1	....	....	2	....
Cranford	....	1	....	....	....	1	....	....	....	1	2	2	....	....	....	....	....	....	....	....	1
Elizabeth	12	7	....	41	10	6	36	65	39	39	66	70	28	10	33	....	18	11	1	4	30
Fanwood	3	....	....	1	....	....	3	2	....	....	1	....	....	....	....	....	....	1	....	....	....
Linden	1	1	....	1	....	....	....	2	2	2	2	6	2	2	2	....	2	1	....	1	....
New Providence	....	1	....	....	....	1	....	2	5	1	1	3	....	....	....	....	1	3	....	....	1
Plainfield	....	3	....	5	7	....	10	17	6	17	22	9	6	7	10	1	2	3	....	....	3
Rahway	1	4	6	15	3	3	10	12	9	11	35	15	14	4	8	3	7	3	....	1	3
Springfield	2	....	....	....	....	....	....	....	1	....	2	1	....	....	1	....	....	....	....	....	....
Summit	2	2	....	....	....	....	4	5	2	5	3	2	....	1	2	....	....	....	....	2	1
Union	1	....	....	1	....	....	....	1	2	4	4	1	2	....	....	1	2	1	....	....	2
Westfield	1	1	....	6	....	5	....	4	5	5	6	5	2	1	1	....	2	1	....	1	2
Totals	24	21	3	73	20	16	63	114	70	86	137	118	55	26	57	4	31	24	1	12	48

Death-rate per 1,000, without cities, 18.01.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

WARREN COUNTY.

Population 36,589

Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrhœal diseases.	Consumption. M	Consumption. F	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Allamuchy	3	2	2	1	6	....	14	648	......	1	....	....	....	2	....	....	....	....	....	1	2	1	....	....	....	1	....	....	....	....
Belvidere	3	6	3	7	10	....	29	1,772	......	1	....	....	7	1	....	1	1	....	2	4	....	3	3	3	....	....	1	1	1	....
Blairstown	5	4	3	6	11	....	29	1,468	......	....	....	....	....	....	....	....	3	1	5	5	3	3	1	1	1	2	1	1	....	....
Franklin	6	3	5	5	11	....	30	1,580	......	....	....	....	2	....	....	1	5	1	3	1	3	3	3	3	....	2	....	1	....	....
Frelinghuysen	....	....	....	1	3	2	6	1,042	......	1	....	....	....	....	....	....	....	1	....	1	....	3	....	....	....	....	....	....	....	1
Greenwich	12	6	6	18	13	1	61	2,554	......	....	2	....	8	....	....	6	7	1	3	2	2	3	1	3	....	....	2	1	1	2
Hackettstown	10	15	7	16	10	....	58	2,408	......	2	1	....	10	....	....	2	4	1	7	3	7	5	....	1	1	2	1	....	1	2
Hardwick	....	2	1	2	2	....	7	583	......	....	....	....	....	....	....	....	....	1	....	....	1	....	1	2	....	....	....	....	....	....
Harmony	7	3	5	6	7	1	31	1,350	......	1	....	....	....	....	....	3	3	1	3	1	1	1	....	2	....	....	....	....	1	2
Hope	7	10	7	5	4	1	34	1,549	......	....	1	....	5	....	....	2	6	2	3	2	1	2	1	1	....	1	1	....	....	....
Independence	3	2	4	7	....	....	16	1,018	......	....	2	....	....	....	....	....	....	2	1	3	1	1	....	1	....	3	....	....	....	....
Knowlton	5	2	10	7	13	....	37	1,476	......	....	4	....	1	....	....	3	2	2	1	5	3	1	1	4	....	....	1	....	....	1
Lopatcong	5	4	3	4	9	....	25	1,691	......	....	1	....	....	....	....	6	4	....	....	1	1	....	....	4	....	1	....	....	....	....
Mansfield	7	8	8	8	16	2	49	1,709	......	....	....	....	6	1	1	3	2	1	3	7	3	1	....	5	....	5	....	....	....	....
Oxford	26	28	19	23	16	1	113	4,594	......	....	3	7	19	....	....	4	16	1	4	17	8	3	2	6	1	3	....	....	3	4
Pahaquarry	....	....	....	....	....	....	....	418	......	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Phillipsburg	54	34	21	34	26	....	169	7,161	23.60	2	6	....	....	....	8	26	34	15	6	13	18	11	1	10	....	2	1	....	2	1
Pohatcong	1	3	3	5	1	....	13	......	......	1	1	....	....	....	....	....	....	....	1	4	1	2	....	1	....	....	....	....	....	....
Washington Borough	12	11	14	19	6	2	64	2,142	......	....	6	....	8	1	1	....	6	2	6	4	3	3	1	6	1	....	....	....	....	4
Washingtown Township	5	2	5	8	11	....	31	1,428	......	....	1	3	1	....	1	....	3	1	1	4	....	2	1	3	1	....	1	....	1	1
Totals	174	146	123	176	174	10	814	36,589	23.34	9	37	10	68	5	6	63	95	33	48	78	56	42	14	56	5	21	9	4	10	18

Death-rate per 1,000, without cities, 21.94.

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REPORT OF THE BUREAU OF VITAL STATISTICS.

NOTE.—The article alluded to, page 28 of Report, is postponed until the next Report.

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SEVENTH ANNUAL REPORT

OF THE

BOARD OF HEALTH

OF THE

STATE OF NEW JERSEY.

1883.

WOODBURY, N. J.:
JAMES D. CARPENTER, BOOK AND JOB PRINTER
1883.

THE STATE BOARD OF HEALTH.

HON. HENRY C. KELSEY, Secretary of State,		
HON. JOHN P. STOCKTON, Attorney-General,		Members *ex officio*.
GEORGE H. COOK, State Geologist,		

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EZRA M. HUNT, M.D.	Trenton.
E. A. OSBORN, C.E.	Middletown.
E. S. ATWATER, Counselor-at-Law	Elizabeth.
LABAN DENNIS, M.D.	Newark.
PROF. CYRUS F. BRACKETT, M.D., LL.D.	Princeton.
FRANKLIN GAUNTT, M.D.	Burlington.
PROF. A. R. LEEDS, Ph.D.	Hoboken.

President	C. F. BRACKETT.
Secretary	E. M. HUNT.
Recording Clerk	E. A. OSBORN.

REPORT OF THE SECRETARY OF THE BOARD.

To His Excellency [illegible]

GENTLEMEN:—The State Board of Health of New Jersey begs leave to present to your Excellency its [illegible] report. The law assigned to it [illegible] the interests of health and [illegible] of the State, to make sanitary investigations [illegible] in respect to the people, the causes of disease, [illegible] and the effects of [illegible] circumstances on the public health, and to gather [illegible] information in respect to these matters as it may deem proper for diffusion among the people." Since that time various other laws have been placed upon the statutes of the State, which have assigned to it other important duties. In the [illegible] we find ourselves charged with responsibilities that relate to [illegible] industrial interests of the citizens, [illegible] the welfare of the whole population.

While there is a general consent to the fact that health is a great blessing, and that the preservation of life is, as a rule, the essential duty of a good government, there is not an adequate appreciation of the value of wellness as a source of strength and prosperity to a State. Industry, capital and security depend upon it as a resource. To foster it is to foster the dearest interests of a people. As science, observation and statistics are constantly showing how many deaths are avoidable and how many diseases are preventible, there is no direction in which intelligent judgment and reasonable expenditure yields better results. It cannot be concealed that premature death and burdens of sickness are constantly resulting from insanitary conditions which never should have occurred. The common consent that nuisances injurious to health must be abated, is an argument that such as could have been avoided should never had occurred. The liberal outlay made to stop an

epidemic after it has attained headway, suggests that a truer economy would have been to avoid its causes or deal with it in the first household. With regard to our own country and our own State, it is not unsafe to re-affirm that the same is true as was some time since asserted by Mr. Simon in reference to England:

"It is the common conviction of those who have most studied the subject, that the deaths which occur are by fully a third part more numerous than they would be if *existing* knowledge of the chief causes of disease were reasonably well applied throughout the country. This annual excess has the terrible further meaning that, as a rule, each death represents a number of other cases in which preventible disease, not fatal, has had far-reaching ill effects on the continued life, or added the many embarrassments which occur from more fatal attacks of sickness.

"Death accounts also, whose figures, arithmetically, make but little show, may, for administrative purposes, have immense meaning. One or two deaths in some village may, in hundreds of instances, correspond to long-continued local conditions of scandalous filth and unwholesomeness; one or two deaths by scarlatina or small-pox, almost unnoted in regard of some considerable town, may represent the beginning of what, three months later, will be a terrible epidemic, agitating the community with distress and fear, and adding prodigiously to the whole year's death rate of the place. In proportion as a disease is present the time of preventing it is past; but, for practical purposes, it is indeed all-important to remember that sanitary administration has its hope of success in preventing, not in arresting, great epidemics; and that if warnings are not taken from the smaller excesses of disease, *catastrophes*, not further warnings, may be next to come. It seems almost unnecessary to add, that a method of procedure which waits for death as its ground of action, may peculiarly dispense with cumulative proofs; and that, as no one preventible death can be remedied in regard of him who has suffered it, so the record of it may the more emphatically claim to be read as a protest on behalf of others."

No one can make even a cursory or superficial study of the contrasts between the death rates and sickness rates of city and country, or parts even of the same city, without learning that these are often but the forcible declaration that either the persons or the places are not conforming to the known laws of healthful existence. Sanitary art, made up as it is of medical and mechanical knowledge, and having ascertained how it is possible to make ground and houses best adapted for human dwelling-places, and how men, women and children should live so as to be true to the demands of sound humanity, no longer

admits that it does not know how to improve the social conditions of a people. The last annual report of the Registrar-General of England (44th, Abstracts of 1881) says: "There is nothing in the series of annual reports issued by this office that comes out more distinctly and unmistakably than the wonderful effects which the sanitary operations of the last decade have had in saving life. The death rate for this year, in England, was 18.9 per 1,000 living. The death rate in the urban population, consisting of some fifteen and a half million persons, was 20.3; while that of the rural population, comprising some ten and a half million of persons, was 16.8. Comparing the years for 1862–71 with those of 1872–81, the deaths in the latter were so much less in proportion that 392,749 persons who, under the old regime, would have died, were, as a matter of fact, still living at the close of 1881. Add to these saved lives the avoidance of at least four times as many attacks of non-fatal illness, and we have the total profits as yet received from sanitary expenditure." These facts are valuable to us for comparison, since they extend over twenty years, and are furnished by skilled observers, and accepted by the best authorities. They relate to a nation in which the teeming population, and the great obstacles constantly presenting, make such an attainment the best assurance of greater possibilities. "There can be no real doubt," says the report, "that the saving effected in life was the direct product of the money and labor expended in sanitary improvement."

The deaths for the State of New Jersey, for the year reaching from July 1st, 1882, to July 1st, 1883, were 23,310; which is a considerable decrease from the previous year, while the marriages and the births have increased. Fuller particulars will be found in the report of the Medical Superintendent of Vital Statistics. A review of the past year, and of the period to which these vital returns relate, together with abundant other testimony afforded to this Board, assure us that both the public and the local health authorities are realizing the great significance of health and care, and the value of those improvements which secure good water, proper disposal for decomposable substances, good houses, cleanly habits, and chances for employment deprived of all avoidable insanitary conditions. Several cities and townships have entirely modified their health administration, and others are so agitating the need as to be sure, eventually, to bring about desired results. The summary of reports from local Boards is well worthy of study as a guide. The relation of the State Board to local Boards has proved of signal advantage to both. Information and guidances are secured,

and that unity and coöperation which gives a system of health administration more and more tending toward efficiency and completeness.

LEGISLATION AND PUBLIC HEALTH.

Sanitary art is so new in its practical application to the wants of communities that it cannot be expected that the courts should abound in precedents, which, in law, so much guide decisions. It is an encouraging starting-point that common law is very considerate of the rights of the individual to be protected from nuisances. It does not always claim that these must be shown to be injurious to public health; but even if they cause decided, frequent discomfort to the public in general, or to ordinary persons of the immediate vicinage, the law calls for their abatement. If the nuisance is not one attended with smoke or odors, but is one which is shown to cause sickness, it is easily abated under the law of nuisances. So long as there are differences of opinion among medical men or sanitarians as to the relations of certain causes to disease, so long will courts and juries have to gather facts and opinions, and be governed by the weight of testimony. As there is often defect in testimony, or in evidence, it cannot be expected that every case will be decided according to the views of Boards of Health. So pronounced, however, is the common law in its declarations as to nuisances, and so evident is its possibilities of relief, as in the mill-dam case at Bound Brook, that the mode of indictment, grand jury complaint and jury trial is never to be lost sight of in that class of cases in which there is no occasion for haste. As, however, there are many cases where delay is dangerous, and as the assumption of danger to health, if real, is always a peril to somebody and to life itself, law is wise in providing methods of more speedy relief. One of these methods, which has been found very useful, is that by Court of Chancery. So far as we know, the claims to summary proceeding in cases where the public health is concerned have been fully recognized by this court.

In a case in Elizabeth, where a factory, in dealing with irritating acids and the sludge from petroleum refineries, was strongly complained of, Chancery granted an expert commission, with power to control, to experiment and to report, as to whether it would be possible to conduct the business and yet secure comfort to the residents of the vicinity. As the general law which gives this power does not reach

all cases, the Legislature, in 1883, passed a law, of which the following are sections (Sections 10, 11, 12, Ch. CV.):

"10. *And be it enacted*, That any such Board of Health, instead of proceeding in a summary way to abate a nuisance or such source of foulness, may file a bill in the Court of Chancery, in the name of the State, on the relation of such Board of Health, for an injunction to prohibit the continuance of such nuisance or source of foulness, and such action shall proceed in the Court of Chancery according to the rules and practice in such cases on the relation of individuals, and cases of emergency shall have precedence of other litigation pending at the time in the Court of Chancery, and may be heard upon final hearing on such notice as the chancellor shall direct.

"11. *And be it enacted*, That in all cases in which it shall be ascertained by the Court of Chancery in such suits that a nuisance or source of foulness existed at the time of finding such bill, substantially as set forth in the same, the court shall have power to abate the same, by injunction or otherwise, according to the practice of the court, and may charge the costs of such suit upon the property whereon such nuisance or source of foulness is found, and enforce the same by sale of the said property on writ of *fieri facias*, or so much thereof as shall be necessary for that purpose, or the said court may order the person or corporation which caused said nuisance or source of foulness, or allowed the same to continue, to pay such costs, and enforce obedience to such order.

"12. *And be it enacted*, That in case no nuisance or other source of foulness, hazardous to the public health shall be found to exist, costs shall not be awarded as of course against the Board of Health which caused such suit to be brought, but only in case it shall appear to the chancellor that no probable cause existed for bringing such suit."

Under this law, a case from the Board of Health of Washington borough, in Warren county, and another from Bridgewater township, in Somerset county, and another from the city of Trenton, have been before the Court of Chancery. These related to cesspools and the pollution of streams, and showed the value of this method of procedure.

The third course of procedure recognized in our law is that which is intended to authorize Boards of Health to view and pronounce upon nuisances. The first sections relating thereto are to be found in Ch. CLV. of the laws of 1880, being Sections 7 and 8 of the law. This law intends to recognize sanitary administration as at times or in some of its methods being of the character of a police power, viewing the Board or its inspector as dealing with a sanitary police measure justifying and requiring summary proceeding. Such a principle has been fully recognized in English courts and in some of our own States.

References can be found in articles in our third and fifth reports, by E. S. Atwater, counselor-at-law, and also in an article by him in the New Jersey Law Journal, May, 1883, entitled "The Police Power and Boards of Health." Two points have seemed to be disputed in this State in decisions made before the mode of procedure, as now designated in legislative enactments, were made. The one is that judgment cannot be pronounced in a case until the person concerned has been summoned to appear, and so have notice and opportunity to be heard. The answer now made to this is that there are cases where the immediate interests of health may not permit of this, and that the sections of the law, as at present framed, provide against oppression. The danger of invasion of the rights of all the citizens are, in such cases, greater than the danger of invasion of the rights of the individual, who is provided also with prompt methods of appeal. On this point this Board has been instructed that the action had is not of the nature of a trial, but a viewing and a pronouncing under the necessities or proprieties of the case, the time for hearing being as soon after as may be, and the Board having to rest the ground of their action on its ability to prove the fact of the nuisance and peril to public health. While it is believed such a view in a case of appeal, where this is the main question at issue, would be sustained, there are others who think it better to serve notice and call the person concerned to a hearing, and then to proceed, not as by trial, to pronounce whether or not the thing complained of needs summary abatement under this law.

Another method by which a Board may "examine the matter in a summary way," is to go before a police justice, and summon the party to appear. In a case tried in this way in an action of the Board of Health of Paterson, the defendant asked a jury, but the justice decided that under the law it was a summary proceeding which did not entitle to a jury at this stage. Such is the spirit and intent of a law intended for a sanitary police measure. The claim for such procedure in peril to public health is as defensible as in numberless cases that come before a police justice, or a justice of the peace acting as such. It was hoped that this case would go up by appeal, but it has not. On appeal it is fully recognized by Boards of Health that their defense must be the fact of nuisance, and that their modes of inspection and of abatement of nuisance have been such as the law and the necessities of the case justify, and that the costs have not been exorbitant.

It is clear that where inspection is forbidden or resisted, or where

attempted removal by the Board of the nuisance is forbidden or resisted, there must be resort to a warrant or other proper method of going upon private premises. Two efficient city Boards have been unable to sustain their cases because of irregularity in these respects. This only shows that full legal advice is required in such cases, and that the forms of law must be observed. As public opinion is generally with Boards in the abatement of nuisances, the great objects of a Board are generally accomplished without that factious opposition which is sure, occasionally, to be met. Yet even this is found, as a rule, to lead to such inquiry as to aid a Board in its work. The powers now conferred on Boards of Health, in this State, are adequate to most emergencies, and, in general, such as will be sustained by the courts, unless they are exercised in a way that cannot be defended. For the time being, the Board must judge of the fact of nuisance. This does not, and probably ought not, prevent their being called upon afterward to rest their right of abatement on their ability to show to a court or jury that the thing complained of was actually a nuisance, although some decisions in other States have recognized the judgment and decision of a Board to be that of experts, and thus final as to the fact. The State Board of Health has, in connection with most of the health laws of this State, availed itself of the opinions of excellent legal and legislative authorities, and believes that the rights of local Boards are as likely to be maintained before the courts as those of any other constituency.

The recent decision (November, 1883,) of the Supreme Court of New Jersey on the milk adulteration act, and the opinion of the court, as delivered by Justice Reed, has important bearing on other laws of the State relative to public health, and confirms these views.

WATER-SUPPLY.

The question of water-supply is so important that it very properly attracts constant attention in this State. The fact that nearly one-half the population of the State is so located, in Hudson, Essex and Union counties, as not to be able to be supplied by wells, necessitates the most careful consideration of the sources of public supply. Intermediate or adjacent rivers are so available for manufacturing and sewerage purposes, that the lines of safety must be closely and accurately drawn. A special commission was, two years since, authorized by the State, in order to determine the best permanent

sources of supply. Owing to inadequacy of appropriation, no survey was made the first year, but under special provisions of the last Legislature, the commission has been steadily at work for the present year, and will no doubt aid in determining the best sources of supply.

It is gratifying to know that in various localities, Boards of Health have directed attention to the need of special inquiry into the value of well waters, the feasibility of cisterns, and to more public sources of supply. Scarcely a town of any prominence, not already supplied, but that has considered the subject. Princeton has secured its supply from a ridge of gravel which was fully tested by competent engineers, both as to quality and capacity, before choice was made. The well is about 25 feet in diameter and 20 feet deep, and is estimated to furnish 150,000 gallons per day. The stand-pipe, 60 feet high, is placed on a trestle 60 feet high. While the question of source of water-supply must always be a relative one, there are many localities where it is best to rely upon gravel beds or nature's store-house in the ground, instead of upon streams surrounded by alluvial soils and carrying an excess of decomposable matters. Skilled aid is always to be sought in making the choice. We know of an instance in this State where a well-intentioned Board has probably made a great error, and entailed much loss upon the city. The Atlantic City water-supply and stand-pipe mark an advance in its history. Ocean Grove has completed its driven well, which goes to a depth of 422 feet, and gives a present supply of 50 gallons per minute. The water is chemically very pure, and at present promises to afford abundant supply. If this proves as constant as expected, no doubt other similar wells can be placed at various localities. Gloucester City has water-works of recent construction. Several other cities are examining into methods of supply or adopting needed improvements.

There is need of some care in placing the water-supply of cities in the hands of companies, since when these are once established it is found difficult to correct any defects as to the quality of supply. Generally, cities should have control of so important an interest. The cleansing of reservoirs and the examination of pipes is too often neglected. A recent cleaning of the Camden reservoir showed an unexpectedly large deposit, and resulted in great improvement of the water-supply. Where water is periodically bad, companies or the people should not accept speculative views as to causes, but avail themselves of those facilities for knowing which science and art so readily afford. We find in too many cities which have a water-supply, that

some of the people rely on wells of doubtful purity. Where this is the case, city authorities should have wells examined, and not allow their use if found to be contaminated. It is very frequently the case that wells are not properly protected at the surface of the ground. It is much the best to have the stone or brick laid in cement for at least three feet from the surface, and then have a stone or arched covering. No water should be allowed to drip back into the well, and the stone itself should be so compacted round about as that no washings of any kind can enter. As the well is the natural drain for the soil for many yards around, the adjacent soil should never receive slops or soiled liquids of any kind, or compost, more than such as can quickly be disposed of by the air and the vegetation. We recently saw a well surrounded by a thick layer of compost; the idea of the owner being either to protect it from cold or to make the ground very rich in the house yard. As a rule a sterile soil around the well is best. Recent investigations are attaching more importance to wells as related to malaria. It is now claimed more than ever before, that in malarial districts the water is often a source of malaria, when the air would not alone cause the manifestation of the disease. The need of a pure water everywhere is such that too much cannot be said in its behalf. I had occasion to examine a well this year, within twenty feet of which one person was dead of typhoid fever and another very sick: the privy was less than two feet from the well, but because it was a driven well of eighteen feet and the vault was only five, the inmates of the house had apprehended no danger. The rinsing of utensils at the well is entirely a too common practice. Water, in numberless instances, has been proven to be the conveyancer of disease, and, where suspected, should always be boiled if intended for drinking purposes.

SEWERAGE.

Questions as to sewerage have pressed themselves upon the attention of the cities and larger towns of the State as never before. No longer is any health resort able to certify to its health attractions unless it can show just how it disposes of its liquid refuse, garbage, etc. That, as a rule, it must not be stored or ponded upon the premises, under ground and out of sight, is now generally conceded. Most of the growing inland cities of the State have come to the same conclusion. The sad effects from the gases of a Passaic cesspool has recently afforded us evidence of what an accumulation of foul gases and organic matter

can do. Where, from temporary necessity, vaults are used, the imperative necessity of frequent and skilled cleansing is admitted. The cesspool, built so as to leak out its liquid unseen into the ground surrounding dwellings, is no longer defended to any large extent. Such leakage can only be justified under special and regulated conditions of soil, locality, emptying and cleansing. Where tight cesspools are used, the quantity of spoiled liquid that accumulates renders its removal quite expensive. Water-carriage, or the conveyance of the fouled liquids and macerated solids by means of sewers, is more generally advocated. Hence, many of our cities are either considering or executing plans of sewers. Atlantic City has consummated a contract to remove, by sewer pipes and water-carriage, all sewage, miles beyond the city limits. Ocean Grove discharges into the ocean by a continuous flow, carrying the sewage out in its fresh state, and to such a distance as renders, it is said, any return impossible. Asbury Park receives it in well-constructed sea-side cesspools, and then discharges at frequent intervals out into the sea. Other of our resorts depend upon the daily dry removal of all closet material. A few still cling to series of cesspools, into which, could the guests look about midsummer, or have report upon the plan, the rooms would be cleared as a matter of wise precaution. When a place essays to bring itself into prominence as a resort for health, it must not regard it as intrusive for all or any one to inquire into its modes of household disposal, and of assumed cleanliness. Happily, with only here and there an exception, our State health resorts have responded to the call, and are, we believe, in advance of those of other States; because, as a rule, they have been more closely watched. Besides, a public sentiment has been created that demands attention to these matters. The great danger now is that work will be imperfectly or hastily done. The readiness with which the average householder, and especially the average plumber, considers himself fully competent to devise and execute some scheme of sewage disposal, heating or ventilation, is only surpassed by the deliberate wisdom with which some council committees sit in judgment and express opinions on purely expert and technical questions of sewer construction and sewage removal. On questions of financial expediency, and some other incidental questions, they are the only real judges; but are rarely competent to decide as to plans of construction or disposal. There is no longer any excuse for errors as to method or for financial extravagance. The principles of dealing with household liquids and refuse are now well understood,

and the methods well devised. The chief trouble in execution is to secure competent oversight and faithful administration.

MALARIA.

During the past year malaria has been much less prevalent in the State than for the last three years. While it can not be said that the essential cause is always known, yet the occasion of its occurrence and the conditions under which it mostly prevails are understood. That it may be produced at a distance, and in certain heavy conditions of atmosphere be wafted to places which otherwise would not have it, is undoubtedly true. But the rule of its occurrence still is that heat, moisture and vegetable decay are the factors in its production. Decomposition and putrefaction of different forms of vegetable matter occur under somewhat different conditions of heat and of moisture. The heat itself varies in degree, and the humidity of the atmosphere affects both persons and places, variously, accordingly as various laws are brought into operation. But the safety from this, as from many other diseases, is in the choice of a locality free from what we know to be the concomitants of this affection, and in such care of personal health as will enable us to resist this and other miasma. Our attention has this year especially been called to local defects of drainage in and near Eatontown, in Monmouth county; Blackwoodtown, in Camden county, and Hope, in Warren county. In each the unusual occurrence of malaria, or to a greater degree than formerly, seems to be attributable to accumulations which have been going on for years, and which at last reach that maximum which in a favoring season is sure to result in malaria. It is a significant fact, that we never yet have found a physician of long experience in any such locality who has not been able to satisfy himself of the relation of local conditions. In the vicinity of Eatontown, some important clearing of the stream has already been done, and, in other cases, investigations are being made with good prospect of abatement.

We need also to draw the attention of citizens to the fact that places which are by nature free from the usual occasions of malaria, may become affected as a result of changes made by construction. We believe, for instance, that there is no strip of land in the United States more free from malaria, than the sea-shore of New Jersey and the land adjacent thereto. Yet here and there we can pick out local-

ities where there are sporadic cases. Nor is it very difficult, as a rule, to trace causes.

Some stream is entirely altered in its course or made to contribute to an artificial lake or pond in an objectionable way. These streams, which are nature's drain pipes, may sometimes, between high hills or in the upper part of their courses, be interrupted by dams or made into ponds. But very rarely is this safe to be done near their outflow. Many such amateur improvements are the devices of those who know little of sanitary engineering, and too often compliment themselves on what pleases the eye at the expense of health. We warn against all such artificial lakes and ponds, unless those really capable have shown how they can be secured without heightening the water level in the surrounding soil, or causing more or less stagnation.

It is to be remembered, too, that in all excavations of soil and building of towns changes of soil and of level are made, and that the sun is shut out so as to cause more moisture of the ground. Whenever we have to deal with a locality naturally healthy, we have great advantages, but must consider the possible effects of every change being made, and by compensatory adjustments retain the local healthfulness. Attention needs to be drawn to the frequent covering up of wet places without any attempt at under-drainage. Many a pond is thus vacated, only that its water may increase the general height of stagnant and subsoil water in the land that is soon to be cut up into lots and offered for building purposes. Salt meadow or marsh is frequently thus covered without even the cutting of lines through its tough sod. "Although a large quantity of salt prevents putrefaction, a small quantity favors it." Dr. Letheby and others have noted the amount of putrid organic vapor from such marshes. When near the sea this is quickly diffused and does not concentrate. But if the mud and grass of these salt tracts is covered over, the organic matter undergoes decomposition under circumstances most favorable for the befouling of ground, of cellars and of streets without any compensatory methods of diffusion or disposal. We can point to places suffering from malaria from this very cause. Let all marshes be drained before the in-filling.

It is not surprising that in some of our cities we are finding an undoubted increase of malarial influences. Besides that addition of animal matter which causes its own class of decay, we are to remember that in cities much vegetable matter finds its way to the soil, and that many a street becomes enriched beyond the usual fertilizing of a field.

The [illegible] of vegetables and [illegible] grasses derived from lands [illegible] in of much organic material, and the growth of low forms of vegetation is constantly and rapidly going on in the soil. Heat and moisture are increased by the locality of buildings, and the air and often the water have to receive particles of vegetable as well as animal growth or decomposition. Under and around houses such a temperature is often sustained in winter as prevents frost and cold, so that with summer conditions it is not surprising that we have summer diseases, and that malaria shows itself in the winter. However much inquirers in localities may indulge hypotheses as to the foreign origin of malaria, and however true it may be that occasionally it is wafted down from some [illegible] spot, the chief fact is that local conditions of the place and some lowering condition of the person prove the occasion of the actual attack. At a recent meeting of the National Public Health Association, papers and discussions on the subject revealed greater unanimity on this point than on any other as to malaria. The belief that water becomes the vehicle of malaria was also fortified by many significant facts. One great want of this State as to the health of its people is that no town should be started, no house should be built, on ground that has not been so thoroughly drained as that the water level as a rule does not maintain itself higher than ten feet below a surface through which the ground air can permeate it. A sweet, dry soil is the beginning of an assurance that healthy beings can be kept upon its surface.

SMALL-POX.

Although small-pox has been less prevalent this year, we have had sufficient to emphasize the importance of vaccination. Situated between two large cities, with many large cities of our own, and with almost the whole State a highway for travel, our only protection from oft-recurring epidemics is in the systematic vaccination of all children that attend the public schools. The introduction of bovine lymph has removed the only possible criticism that could be made upon the operation, and the reality of the protection is each year more fully illustrated. Even where there are failures, the facts in evidence show the reasons of the failure and so substantiate the law. Our last report in a thorough manner put on record all needed particulars, and (Circulars 18 and 20, fourth report, 1880, page 301, and fifth report, 1881, page 178,) give all necessary details as to procedure in

case of an outbreak. In an outbreak that occurred this year, the refusal of a parent to have a child at home vaccinated, not only resulted in its death but in the spread of the disease. While in scarlet fever and measles we have no mode of protection such as that provided against small-pox, experience shows that by isolation of those attacked, by oiling so as to prevent the scarf skin from being blown about during convalescence, by a thorough airing, washing or burning of all articles in the house, and by an enforced cleanliness of persons and surroundings, we can prevent these diseases from growing into epidemics. The contagion, while it is persistent, and will dwell long in unaired localities or uncleansed and unaired garments, is not transmissible through the open air for long distances. Well-understood methods of management at the start would often prevent the necessity of school dismissal, which may cause a scattering of the disease or an interruption of study.

While these diseases are not believed to have a local origin, they are rendered malignant by foulness, and so every effort at ventilation, cleanliness and disinfection should be secured.

Diphtheria and typhoid fever, on the other hand, seem to originate from household vegetable decay and dampness, from impure water and from other local conditions; and so, both for prevention and for relief, require the most assiduous cleanliness. For further particulars as to these and other diseases, reference may be had to the summary of local reports and to the record of the medical superintendent of vital statistics.

CHOLERA.

During the past summer, the facts as to cholera in Egypt were such as to lead many of the European governments to the adoption of precautionary measures. Past experience has shown its tendency to advance, and the disease has not been mitigated in its severity. The rapid transatlantic transportation now, makes it very certain that the disease occurring in Germany, England or France, will be more rapidly transmitted to us. While there has been some modification of quarantine methods, there has been no alteration of views as to the necessity of at once isolating individual cases, or as to the need of the most thorough sanitary precautions as to cleanliness, in order to prevent it from attaining the proportions of an epidemic. Hudson county and some other portions of the State are especially exposed, and are not able to avail themselves of as ready or complete sanitary

provisions as are in operation in New York. In case of any threatened or actual outbreak, this Board will be prepared with all necessary instructions, but on the prevision and preparation of local authorities must chiefly rest the duty of active and timely relief. Especial attention early in the spring should be given to thorough cleansing, and sanitary police of all cities and each local Board should know just what it would do in case of a sudden outbreak. Cholera and other hospitals are now quickly improvised at small expense; models of which can be had at this office or from other sources. It is this readiness beforehand to meet possible emergencies, and which the first day does just what ought to be done, that avoids those sad consequences which a delay of a few hours sometimes secures. Our power to prevent epidemics is almost absolute, if we meet them at the threshold, or have hold of the checks and apply them in time.

DISINFECTION AND DISINFECTANTS.

While our chief reliance is upon ventilation and cleanliness, the value of thorough disinfection is fully established and sustained.

Circular VIII. (4th Report, 1880, p. 260,) gives all necessary particulars as to their use. Since the issue of that circular, commercial sulphuric acid, in the proportion of a pint to eight gallons of water, has been accredited as valuable to be sprinkled about for the destruction of low forms of vegetative life associated with diseases.

Fumigation with roll sulphur cracked fine and set on fire, so as to have its fumes enter every part of the house while unoccupied, is very valuable. Privy and cesspool vaults may well be cleansed by letting down a tin tomato can with lighted sulphur in it, and then closing the cover or seat, so as to have the gas permeate the whole vault.

One ounce of nitrate of lead dissolved in a pint of hot water, and a pint of salt dissolved in two pailsful of cold water, and the two mixed, gives a valuable chloride of lead disinfectant. Sulphate of iron (copperas or green vitriol), two pounds to a gallon of water, is also greatly to be valued as a disinfectant.

Corrosive sublimate, in the proportion of one part to 500 of water, has great value as a preservative and disinfectant. The poisonous character of some of these disinfecting solutions, if taken into the stomach, must be borne in mind.

Besides the use of other disinfectants in the sick-room, the vapor of tar or the fumes from a vessel of boiling water containing tar, placed

upon the stove, are often found serviceable. The use of whitewash, and its value as a cleanser and disinfectant, is never to be lost sight of.

The recipe for the whitewash known as the Treasury or White House whitewash is as follows:

"Slake one-half bushel of unslaked lime with boiling water, keeping it covered during the process. Strain it, and add a peck of salt dissolved in warm water; three pounds of ground rice put in boiling water and boiled to a thin paste, and one-half pound of powdered Spanish whiting, and one pound of clear glue dissolved in warm water. Mix these well together, and let the mixture stand for several days. Keep the wash thus prepared in a kettle or portable furnace, and when used put it on as hot as possible, with painter's or whitewash brushes."

The glue should be soaked in about three quarts of warm water over night, and then the Spanish whiting added to it. When there is old whitewash on the walls which is flaky or makes them uneven, it should be scraped off, and the walls have a thorough washing with a solution of sulphate of zinc (white vitriol), two ounces to a gallon of water, and be allowed to dry before applying the whitewash.

HEATING AND VENTILATION.

These are so related to each other, and are so important to health, as to require the attention of all. Probably more disease arises from impure air in houses and schools and public buildings than from all other causes combined. The larger proportion of diseases are those which first affect some portion of the breathing apparatus. In order to secure greater heat, air is confined, and so ventilation impeded. Many of the present heating devices heat the foul air in the room or depend upon a room supply. As a rule, it is much better to introduce into a room pure air which has come from without and been heated on its way to the room occupied.

Persons will bear change of air, even if a little cooler than the air of the room, much more than is supposed, if only it is introduced without draught. Mosquito wires are thus of value, during the fall, as impeding draughts of air, and yet allowing the air to pass in. The placing of a small strip under the base of the lower sash, so as to make an entrance place for air between it and the upper sash, and yet have no direct draught, is of much service. All occupied rooms

should, each day, if possible, be flushed with air when the inmates are out. This is especially important to school rooms, factories, public halls, bed-rooms, etc. It is a mistake to suppose that every corner of a room gets good ventilation by the opening of a single window when there is but little stir in the air. Experiments show that air clings to surfaces; that the sides and corners of rooms often have air much fouler than that found in the center. The distribution of heat in a room is a pretty good index of the distribution of air; and this is found to be quite variable. "If air is admitted at a high temperature, and allowed to escape through openings at or near the top of the room," it does not ventilate the room much. "Where heated fresh air is introduced, as where buildings are warmed by hot-air furnaces, or by steam coils placed in the basement, the air enters the room at a comparatively high temperature—too high, in fact, for either comfort or health. In all cases it should be possible, by the operation of a valve, to permit more or less cold air to mingle with the heated air, and this should be done in such a way that the temperature of the air admitted into the room can be regulated without at all diminishing its quantity."

School buildings and all factory buildings in the State should have expert examination to determine as to their fitness to conserve the health of those who are employed in them. All experience is constantly attesting that no device will supply the absence of that pure outer air of which oxygen is so large a constituent. Dr. R. Angus Smith, one of the inspectors and chemists under the Rivers Pollution Prevention Act of England, in closing a report of one hundred and eighteen pages, says: "This report may be said to be chiefly on the value of oxygen in destroying putrefaction, in oxidizing impurities of nearly all kinds, and, of course, in preserving water and air from the unwholesome agencies to which they are exposed."

MOISTURE OF AIR ARTIFICIALLY HEATED.

In the last report, the principles which determine the moisture of warmed air are plainly stated in an article by Prof. C. F. Brackett. It is there shown that the condition of humidity is a relative one, the adjustment of which depends upon the adaptation of heat and moisture to varying conditions of outer moisture, and of room heat and atmosphere.

Prof. Kedzie, in the first Michigan report, in speaking on this subject in reference to school rooms, says:

"In many cases the out-door air is heated to the requisite temperature and brought into the room without any addition of watery vapor. Many persons forget that the capacity of the air to hold watery vapor increases much faster than the temperature. For example, air at 32°, saturated with watery vapor, if heated to 60° without either loss or gain of watery vapor, would be excessively dry. If we represent the humidity of air saturated at 32° as 100, the same air heated to 60° would have a relative humidity of less than 15; or it would hold less than one-sixth of the water it was capable of holding in the form of vapor at the latter temperature. Lehman has shown that the exhalation of carbonic acid in respiration is very sensibly influenced by the amount of watery vapor present in the inspired air. This may explain why persons are so often afflicted with headache when breathing very dry air, and why relief is so soon experienced when the air is moistened by placing a dish of water to evaporate on the stove. Buckheim has also shown that the depth of the inspiration is decidedly influenced by the presence of watery vapor in the air. The influence of excessively dry air on the naturally moist mucus surfaces is injurious; the nostrils become dry and irritable, and a tendency to catarrh is established. Most persons have observed the relief obtained by breathing air saturated with moisture ('inhaling steam') when they have taken cold, or 'have a sore throat.' The influence of too dry air on the eye is also injurious, from the unnatural drying of the normal secretions for moistening the eye.

"The air in the school room should be three-fourths saturated with watery vapor. The best way to test the degree of moisture is to suspend two thermometers side by side, one in the usual condition, the other with the bulb covered with a thin piece of cotton cloth kept constantly moist by dipping a portion of the cotton in a suspended cup of pure water. The difference in temperature between the wet bulb and the dry bulb thermometer will indicate the relative dryness of the air. Thus, if the dry bulb marks 65°, and the wet bulb marks 60°, the air is exactly three-fourths saturated, and the difference between the wet and dry bulb thermometer should not exceed 5° in any school room."

"The capacity of air to contain moisture is greatly increased by the elevation of its temperature."

"One effect of heat upon air is to raise its point of saturation. One cubic foot of air, say at 32°, is capable of containing a certain quantity of moisture, and no more. But if we raise its temperature to 80°, which is near that of the human body, it is capable of containing five times as much, and, consequently, it absorbs moisture from everything that contains any. This heating of the air does not dry it in the sense

of extracting moisture from it; it only increases its capacity of containing water, thereby rendering it more absorbent or thirsty. Air suddenly heated is thus rendered unwholesomely dry, and [illegible] important point in regard to the subject of warming, requiring [illegible] consideration. Whenever the fresh air is warmed before being admitted into a room, an evaporating pan, or some other means [illegible] provided to supply the air with the necessary degree of moisture."

The illustration of Prof. Brackett, is that, with an outside [illegible] 32 F., and an inside warmth of 62 F., from a vessel of [illegible] with water so placed on a stove as that it will be kept at a temperature of 122 F., we would secure an evaporation of [illegible] a half a pound of water an hour.

In advocating the use of water warmed in [illegible] be entirely governed by abstract questions relating to [illegible] relative humidity. Mr. Robert Briggs, in his [illegible] Relation of Moisture in Air to Health and Comfort [illegible] our ability to determine the regulation of artificial [illegible] knowledge of the physical laws as to the relation of [illegible]

"It must be admitted, however, that some [illegible] is a necessity for comfort, and with comfort [illegible] may be found to establish the healthfulness [illegible] is certain, from all experience, that from [illegible] can be added to air after it is heated, [illegible] eally to the eyes, with apparently [illegible] may make the occupant of a heated room [illegible] door exposure. Moisture may, to some [illegible] the means of heating, especially when [illegible] air furnaces; at all events, the presence of [illegible] over which the heated air is allowed to pass [illegible] means of supplying a small quantity [illegible] lation. But the quantity supplied [illegible] parison with what is needed to [illegible] what can be denominated 'hydration' [illegible] condition."

"It is very difficult to find any [illegible] this requirement of a small supply [illegible] admit, or can demonstrate, that [illegible] so far below what is needed for [illegible] moisture condition of the air [illegible] vaporization seems desirable [illegible] explanation of the offensiveness [illegible] with much diligence, and [illegible] much positiveness."

After noticing the fallacy of the ozone and electrical changes of condition as grounds for this need, he says:

"Altogether, the whole resolves itself to the reiteration of the bare fact, that it is comfortable to evaporate a small quantity of water in heated rooms, and that it can be done without marked injury to the occupants or to visitors. The quantity itself seems to be almost constant for all temperatures or hygromations of the air, and to be a slight addition only to the moisture in the normal air out of doors at any time."

Dr. Billings, in his letters to a young architect, on ventilation and heating, speaks thus:

"In living rooms, heated by a hot-air furnace, or by indirect radiation by steam, the use of a large coarse moist sponge in front of the register will often be a source of great comfort. Vessels of porous clay, through which water percolates rapidly, are used for the same purpose.

"This brings us to the question of attempting to regulate the moisture of the air in connection with apparatus for heating and ventilation. The precise influence which either the absolute or the relative amount of moisture in air has upon health is uncertain, for habit enables man to undergo great variations in this respect without marked ill-effect."

"The effects produced in air by artificial heat, and which, by some, are supposed to be connected with moisture, are important, and merit more study than they have yet received.

"Dr. Ure describes the effects of the use of highly-heated cockle stoves to be tension or fullness of the head, flushings of the countenance, frequent confusion of ideas, coldness of the extremities, and feeble pulse. Hood confirms this, and states (p. 326) that he examined a school heated in the same manner, and found it to be so pernicious to the health of the children that they occasionally dropped off their seat in fainting fits. He goes on to say that 'these pernicious effects, although generally in a somewhat less degree, always result from the use of intensely heated metallic surfaces. They are, however, much modified by tempering the air by the evaporation of water. In Russia and Sweden, the Apennines, and other places where close stoves are used, an earthen vessel of water is always placed on the stove for this purpose, and greatly mitigates the oppressive effects which would otherwise be experienced."

He then asks the question—"If it is not the dryness of the air which causes the disagreeable sensations, whose frequency in furnace and steam-heated rooms no one can deny, what is it?" and adds, as follows:

"My answer is, that it is no single cause, but a combination of a number of causes. The first and most important is the want of sufficient fresh air to insure satisfactory ventilation. The amount of air required for this purpose, if admitted after passing through the heating chamber of an ordinary furnace, would soon make the room insufferably hot, for on a cold day its temperature from the common forms of apparatus will average 180° F. To prevent this, the register is usually partially or entirely closed as soon as the room becomes unpleasantly warm, and the fresh air is thus shut off as well as the heat.

"The second cause is the contamination of the fresh heated air by gases from the furnace, and especially by carbonic oxide. This will be found to be the chief trouble in those cases where a dull, persistent headache, with the feeling as if an iron band were bound around the head is produced, or in such cases as those mentioned by Ure and Hood.

"From hot-air furnaces these gases pass mainly at the joints, and the more joints a furnace has the worse it is in this respect.

"A very common cause of impurity in air heated either directly by furnaces, or indirectly by steam or hot water, when the furnace is in the cellar, is leakage from the cellar into the cold-air flues or chambers. Brick piers, enclosing coils or radiators, are quite pervious to air, and the pipes or box flues used to bring fresh air to the heating surfaces leak very decidedly in the majority of cases.

"A very common method used by servants for diminishing heat is to open the furnace door, and at the same time to obstruct the draft below. This gives rise to large volumes of carbonic oxide, some of which will almost assuredly escape into the cellar, and it requires the presence of but a very little percentage of this gas to produce bad results.

"The last cause of discomfort which I need mention here, is over-heating in rooms which are occupied by a number of persons."

It is now generally conceded that the benefit or comfort derived from the evaporation of water on a stove is not to be accounted for merely by its direct effect upon the humidity. Dry air, in the open, is often very healthy and invigorating. On the other hand, where the degrees of moisture approaches closely to saturation, and the temperature is pretty high, the air becomes sultry and oppressive as interfering with evaporation from the person, etc.; where there is over-moisture, it tends to attract to itself organic particles. Thus, even the hand held closely, for a time, against the walls of a sick room or hospital will show odor from the effects of the moisture. A continuous moisture in illy-ventilated or sick rooms tends to promote or develop disease. "Our dwellings, although the water-troughs of our hot-air

furnaces do supply limited quantities of vapor with admitted comfort, do not, as a rule, have over 30 to 40 per cent. of humidity in the air within them."

The most probable view of the benefit of this slight added evaporation is that the moisture or vapor thus given to the air attracts to itself dust and organic particles which are thus, as it were, retired from the in-breathed air, and so settle as to be removed or changed by ventilation, sweeping, dusting and general cleanliness. The benefit is not so directly in diminishing the dryness of the air as in furnishing such small degree of extra moisture as will get, in company with floating organic material of any kind, volatile gases, and cause these to be somewhat settled or disposed of by vapor. "Organic matter appears, mainly, to be in connection with the vapor in the air, and not to exist as a separate gas diffused in the dry air when the vapor is removed by natural causes." Thus, while there is still a field of inquiry, it can be said to be the opinion of authorities, as well as the experience of individuals, that water kept at a temperature above 125° on a stove or in a water-holder in the register, or a sponge, adds to our sense of comfort when occupying artificially-heated rooms. The water-holder of the furnace is not so direct in its effect on the air coming into the room, as is that on stoves or in water-holders in registers, unless the air is heated where the holder is, and is then introduced into the room as by the indirect method. As the water-holders are arranged on many stoves, the water never becomes warm enough to be of any service. It is often well to fill the water-holder with water already quite hot.

SCHOOL HYGIENE.

To all who have studied the welfare of population as related to physical care, it is evident that the most important reforms, both as to personal and public health, must begin in a proper training and instruction of the children of the State. Personal habits fully formed are always hard to change, and hence success in prevention requires early discipline. Also, where nuisances or conditions unfriendly to health have come to be tolerated, it is the more difficult to convince people of their evils and so to secure relief. That there are great defects in physical child-training and care is no longer a matter of general observation. In examinations of homes, and of the conditions to which children are subjected in school-houses and factories, and of classified particulars as to the results of imperfect methods, illustra-

tions of wrong seating, imperfect light, bad air, have so multiplied that no longer can school boards or factory owners brush aside the facts in evidence.

Insanitary conditions are recording their results upon our population. By enforced inheritance, or by personal and acquired disabilities, many are made to worry through life with a burden of ill health or reduced vigor, and so evil comes not less to the State than to the individual. While there is a tacit consent to this fact, and a respectful patronage of such views, as yet there is no adequate training and instruction in the practical administration of hygiene. Instead of the floating knowledge which most teachers are presumed to possess as to proper hygienic conditions, both for the child and his surroundings, there should be such definite information as will enable the teacher to exemplify, to teach and to carry out a proper bodily discipline and education. We are glad to say that the State Superintendent and some of the city superintendents of schools appreciate such views, and would be glad to see definite provision for such instruction. It would include not only a proper assortment of calisthenics, gymnastics and athletics, but instruction in all those details which direct the child as to personal care and habits, and make him intelligent as to the management of a machine of which he must be the chief superintendent through life. All the members of the Board have been earnest in their endeavors in this direction. A circular issued this year has been largely called for in the State, and, where teachers and superintendents have shown an interest, has had extended distribution. We had hoped that, ere this, the Normal School would have had some definite provision for fitting its pupils to teach the principles and practice of hygiene. If many of its graduates are employed as teachers in the State, this would be the most ready method of reaching the various district schools. Independent of this, the city and county superintendents can do much in the important relations they bear to the public schools. To-day the school system of the State admits of greater improvement in this direction than in any other. We are not sure but that, in a social aspect, the care of the health is as important as care of intellectual education. We are sure that it is just as sensible to leave the childhood of the mind without instruction as it is to leave the childhood of the body. Unskilled instinct will do about as much for the one as for the other. Care of the growing child, as to health as well as to mental drill, belong to the economies of the State. It has a right to be recognized in the fund which the State provides to

secure the welfare of its people. For, whatever gratuity the State confers on its children, it confers in order that they may grow up with such bodies, minds and characters as shall give strength, prosperity and stability to the State. This Board, therefore, begs leave to call the attention of your Excellency, and of the Legislature of the State, to child-care—the preservation of its life and health, in home, in school, in factory—as a great civic duty and a great civic policy. The outcome of its neglect is not only sickness and death, but diminished industrial and productive abililty, a burden manifesting itself in various forms of thriftlessness, finding its outcome in generally increased taxation, and in that special form of heavy expenditure and loss which pauperism, insanity and crime entail.

SANITARY EXAMINATIONS.

The feasibility of sanitary and institutional examinations has been well illustrated during the year. The Board, by its visits and correspondence, is able to give guiding information, to correct many errors, and to outline plans which local authorities can investigate and execute. Not only has this resulted in great improvements at most of our summer resorts, but Boards of Health throughout the State come to be inquisitive as to what needs to be done and intelligent as to methods, even where conditions of inability or inexpediency postpone what will eventually be accomplished. As a distinguished lawyer of this State has expressed it, "the occasional failures which come to notice are but the indices of innumerable successes that have been made in various parts of the State, and have resulted in a more general and intelligent attention to the conditions promotive of good health." It has often been the duty of the Board to be very explicit in its disapproval of local conditions, and it is an index of popular sentiment that so generally there has been effective response to the suggestions made. Not only in State institutions, but in county institutions, we have found the officers ready to consider defects and to remedy as fast as circumstances would allow. While many institutions are models of care and of discipline, others have been found that needed thorough change of method. The habit of personal and close examination on the part of committees or directors, is not the rule, and even where it has been attempted, some evils are overlooked, which are readily admitted when pointed out by those of greater skill or experience in this particular direction. While special inquiry into

personal conditions will now probably fall under the care of a Council of Charities and Correction, this Board will still coöperate in careful sanitary oversight and insight.

INDUSTRIAL TRADES AND FACTORY OPERATIVES.

The attention now being drawn to industrial trades in factories, to factory labor in this country, and to the health of operatives, in the interests both of their health and of prosperity for the State, is very important. In coöperation with this work, the Board issued an industrial circular of "Health Counsels for Working People." We have also examined into the various laws regulating factory labor in England. While there may be some difference of opinion as to the practical methods of carrying on factory inspection and regulating the health interests of workmen, we must feel that such matters cannot be wholly left to the judgment or inclination of employes.

EFFLUVIUM OR ODOR NUISANCES.

Complaints not infrequently reach us as to the establishment of factories or other works which, either by organic putrescible matter directly infused into the air or through disagreeable smoke, cause great unpleasantness or sickness to the people of the vicinity. The laws of New York have become very stringent as to such evils, and too often location is changed to our own shores. Some of these occupations might be conducted without harm if proper machinery for wetting or consuming the organic matter was employed and the stokers or other workmen were always diligent in service. Others are so vile, as like nitro-glycerine factories or powder magazines, needing to be located far from the haunts of travel or of trade.

It is always in the interests of cities and townships, when such a factory is being located, to inquire into its character, and for the City or Township Board of Health either to seek injunction or to notify parties that they will be held from allowing their factory to become a nuisance. Where there is already complaint both common law and special statutes provide modes of procedure. While all proper local industries should be encouraged, it is to the interests of each locality that its people be protected from trades and occupations injurious to the general health, or so annoying and distressing to the average inhabitant as to cause such discomfort and impurity and nauseousness of air

as is an infringement upon the inalienable rights of the citizen. From Bayonne, Woodbridge, Belleville, etc., serious complaints have reached this Board. Local authorities, under proper legal guidance, have, by the laws of this State, great control over such nuisances. While workmen in these and other industries may for a time seem unaffected or may even survive any perceivable injury, statistics as well as experience show that race vitality is deteriorated.

CONTAGIOUS DISEASES OF ANIMALS.

The laws relating to the contagious diseases of animals, as in operation in this State, require careful oversight and administration. These diseases are of great interest as comparative studies, and as affecting the meat and milk supply and the revenues of the State.

While contagious pleuro-pneumonia has occurred only in a few localities, it still claims large attention. The removal of some restrictive laws in New York State has exposed us to the contagion from that vicinity. There is need of some national legislation to regulate the inter-State traffic, so that it shall not be too restrictive, and yet secure a registry of dealers and some inspection.

Our chief outbreaks have been in Hudson, Essex, Union and Hunterdon counties, and in these mostly confined to single neighborhoods. In accordance with a provision of the law since January, 1883, we have permitted inoculation of infected herds where the disease threatened to spread. Our experience with it has been satisfactory; but it is plain that it must be kept under strict State supervision; if not, it will be spread by those mingling with the disease, or its unskillful doing will lead to false security and disappointment. Some, in ignorance, have proceeded to inoculate before the facts were known to the Board; but this has never been from intentional disregard of the law on the part of owners. Here and there we have evidence of bad intent on the part of dealers. An occasional suit at law is necessary, and thus far the courts have fully sustained the law.

This is becoming more and more a milk-producing State. The amount invested in cattle is so large as to make it a great interest to protect herds from diseases which arise only from contagion. All details as to the execution of this law will be found in the report which we are required to make to the Board of Agriculture.

A serious outbreak of glanders, in a car stable at Newark, required the slaughter of about forty horses. The Board was able to cooperate

with the local authorities, and with the owner, in the eradication of the disease. Fortunately, no more contracted the disease; although it is one of the few diseases that is sometimes contracted by the exposure of torn or abraded surfaces thereto. A few horses beside these have been found affected in other parts of the State, and have been destroyed. There is need of more watchfulness against this disease. Often it does not incapacitate the animal from work, and so is apt to be spread. A special law makes it an offense to keep a horse thus diseased. The law, also, as to cruelty to animals, has been brought to bear against the use of horses which have contracted the disease. The proper transportation of animals is a matter that, not only in humane interests, but in those relating to food, should receive more attention.

Local Boards of Health have it in their power to do much to prevent the spread of these communicable animal diseases. The assessor, or other officer, should know where animals are kept, and if there are any losses. In cities, all keepers of cattle should be registered. It is a duty which local health authorities owe to the public to see that such sickness is not spread among herds, and that the people are not imposed upon by the sale of animals so affected as to be unfit for food. We are glad to say that, in the administration of this law, we have been much aided by the approval of the Board of Agriculture, and the good sentiment as to it that obtains among farmers aware of its provisions.

COMMENTS ON LAWS.

In the last Report, a full index of laws relating to public health was given for convenience of reference. (Sixth Report, 1882, pp. 255–260.) Of these, the laws which are oftenest referred to, as related to the present work and authority of local Boards, are as follows:

Chapter	LXXI.,	page 117,	Laws of	1879.	As to vital statistics.
"	CLV.,	" 206,	"	1880.	As to local Boards, etc.
"	CXXV.,	" 160,	"	1881.	" " "
"	CLV.,	" 217,	"	1882.	" " "
"	CV.,	" 119,	"	1883.	" " "

The chief acts of the Legislature of 1883 relating to public health were as follows:

Chapter	XVII., page 25.	As to sewers.
"	XXIV.	Allows cities to increase appropriations for public health.
"	LVII.	As to the employment of minors.

Chapter	XCVII.	Regulating the sale of petroleum and its products.
"	CIV.	As to pleuro-pneumonia.
"	CV.	As to local Boards of Health
"	CVIII.	As to practice of medicine and surgery.
"	CXXXIX.	Adulteration of foods.
"	CLIV.	Burial of all small or other animals.
"	CLXXXV.	As to skimmed milk.
"	CLXXXVIII.	An act to authorize and enable small land owners to drain and improve their lands.
"	CCV.	Council of State Charities.
"	CCVIII., page 259.	As to sewers in cities of the first class.

A few other laws were also passed that had a collateral reference to matters affecting the public health. There is need that new laws introduced be compared with laws already in existence, and that there shall not be unnecessary multiplication of statutes. It will probably be necessary ere long for the Board to collect and codify the various laws relating to public health. They are, however, easily accessible now, and when needing any special explanation, the opinion of a lawyer who is fully conversant with all the laws passed is better than the ready interpretation of those of less experience. The many laws and sections of laws impose duties on the State Board, and these from time to time have had some addition or modification.

Two or three changes made last year in the law as to the contagious diseases of animals, have made it more facile of application. Some farmers claim that when inoculation is done in an infected herd, to prevent contagious pleuro-pneumonia from spreading, it should be done at the expense of the State.

The law more closely defining the powers of local Boards, Chapter CV., 1883, and giving summary proceeding before Court of Chancery, was a valuable addition to the health legislation of the State.

The drainage law, to authorize and enable small land owners to drain and improve their lands, is in the interests of health as much as of property.

The law as to petroleum and its compounds is now found very effective, and it is doubted whether any more legislation is needed as to it. In some cities, local authorities might aid in the collection of samples and frequency of examinations.

The law as to the adulteration of foods, drugs, etc., led the Board to appoint a Committee or Council of Analysts. Considerable preparatory work has been done with little expense. We do not deem it necessary to repeat many chemical analyses already made, and are

aiming so to adjust and administer the law as to reach adulterations injurious to health, and next such fraudulent admixtures as reduce needed food values. While we cannot report much activity in the application of the law, it has not been neglected, but given time for cautious preparation for future inquiry.

We have had many attestations of the value of the present general milk law of the State, and have not been made aware of any cases during the year where it is complained of as invading private rights. As our relation to this law is incidental, and as it was framed as a measure of protection of farmers, we refer for further information to them and to the Milk Inspector. He has proved himself faithful, honorable and efficient in his duties.

The law passed last year constituting a Council of Charities and Corrections is capable of being applied with much advantage to the State. In our sanitary inquiries and personal visitations, we shall be glad to coöperate with those who may be chosen to fulfill this trust.

The law as to medical registry was so far perfected last year as to secure an index list of all those who have complied with the law of 1880, and the supplements thereto since passed. Some, who had filed their diplomas under a former law, did not understand these more recent laws to necessitate a re-file or re-registry, although, taken as a whole, they evidently mean this. With a few exceptions they have been so understood.

Had the index reached back to the first New Jersey law, it would have been impossible to have secured a roll of names that would have given any correct list of present practitioners. As it is, the lists will be found quite complete, and any additions to be made will be supplied the next year.

It has been recognized by some of the States, that the coroner law, similar to our own, is defective in method in securing reliable results, and is very expensive. Consequently, some of the States, as Massachusetts and Connecticut, have made a radical change which has commended itself to the lawyers and physicians of these States, as well as to the general public. This matter has been brought to the attention of some competent persons in the State, and it is hoped that ere long some legislation will be secured more simple and effective for the ends designed.

A law, in some form, regulating the connection of houses with sewers and cesspools would greatly decrease the risks to the general

health which now occur from hidden and imperfect work. The influence of private dwellings on public hygiene cannot be disregarded. The principle of inspection of buildings, in order to insure safety, is now well-established in various cities. Because of its extra hazard, it is not invidious to select out the pipe-work of houses as demanding some special oversight. While a law, introduced last winter, did not fully commend itself to our judgment, we beg to express the view that some legislation as to it is desirable, so as to be applicable to such cities as, in the esteem of local authorities, may need it.

It can be said, in general, that the State has been wise and liberal in providing laws conservative of the public health. While it insists that no private property shall be entered upon without permission of the householder, except by due process of law, it does mean that nuisances, hazardous to health, shall not be legalized, and that they shall be reached by proper process as speedily as a due regard to individual rights will permit. Increasing intelligence, as to health matters, on the part of the people, increasing demands for cleanliness by those who seek homes in boarding places or health resorts, and a clearer and fuller knowledge of their powers and their proper exercise by Boards of Health, will much aid in diminishing the frequency and extent of preventable diseases. While the time will never come, that there will not be those who quarrel with just and equitable laws, because of their own misconceptions, yet, in such a line, even contention and occasional triumphs on the part of offenders, as a rule, result in a greater regard for the necessities of relative duties, and of consent to the ordinances which a proper regard for the health of the people requires.

CIRCULARS, LIBRARY, ETC.

Circulars which have been issued or re-issued by the Board this year will appear in the Report. Former circulars can be had by their numbers as they appear in the Sixth Report, except that No. 37, as there given, should be No. 38.

The library of the Board, both by exchanges and purchases, is increasing in value and importance. It is accessible, as heretofore, and is of much service to individuals and to local Boards. The catalogue is contained in the fifth report, and the list of additions will appear next year.

A paper on "Cemeteries and Interments in Cities," which was deferred from last year, will be found in this report. An extended

contribution, both to the literature and experience of the past as to interments, by Stephen Wickes, M. D., is to be found in the transactions of the New Jersey State Medical Society for 1883. It is hoped that these two papers will lead to greater caution in the location and management of cemeteries. The choice of locality should be regulated by local health authorities.

The various papers contained in this report have been prepared with reference to general needs, and so as not to repeat the information contained in former reports.

It is the constant effort of the Board to furnish such information as will be of permanent value to the households and the people of the State, and such statistical and other facts as will aid in the prevention of disease.

EXPOSURE AND DISEASES OF OPERATIVES.

This year the Board has made a preliminary inquiry into the chief exposure and diseases of a few classes of operatives. It is hoped that we shall be able to follow these up with observations by those who live or practice much among special classes of tradesmen.

The influence of the inhalation of dust, in many occupations, is such as to have given a special name (pneumokoniosis) to diseases of the lungs caused by dust. Dr. Birch-Hirschfeld, in Vol. II. of Dr. Hermann Eulenberg's Handbook, thus speaks of it:

"Formerly the question was considered only in reference to the merely mechanical action of dust or it poisonous properties, as in the case of arsenic, &c., but the researches of Koch, and especially his discovery of the tubercle bacillus, have given a new feature to the question.

"The greater frequency of tuberculosis among persons working in ill-ventilated and dusty rooms is well known, but there seems now good grounds for believing that however much these conditions may favor the development of tubercle, and though dust *per se* may lead to various pulmonary disorders, actual tubercle originates in direct infection from the inhalation of the bacilli present in the atmosphere of such workshops. And this view is supported by the greater frequency of tubercle among persons working together in numbers than among those equally exposed to dust, but following their occupations alone or at home.

"The diseases immediately brought about by the mechanical action of dust are quite distinct from tuberculosis, and are chiefly, more or less, chronic bronchial catarrhs, leading to bronchiectasis, emphysema, chronic catarrhal pneumonia, and consequent ulceration and destruc-

tion of lung tissue, interstitial pneumonia or cirrhosis of the lung, in fact, all forms of non-tubercular phthisis.

"Acute pneumonia, too, seems, from the observations of Hirt, to be much more frequent among persons employed in dusty trades, and more so when the dust is of a mineral than of an organic kind. Indeed, the greater irritation produced by the former, apart from any chemical action or toxic property, is well known. The majority of the particles, it is true, do not reach the ultimate divisions of the bronchi, and are carried back by the cilia, so much so, that after a short absence from such exposure the whole are removed, and the effects must be mostly reflex, or conducted to the vesicles from the actual seat of irritation, but a portion does certainly remain. Inorganic and other particles are found in the expectorated cells, and *post mortem* in the cells and lymphatic vessels and glands. Merkel found in the lungs of needle grinders, as much as .8 per cent., and Zenker 1.45 per cent. of iron, while the ash of the lungs of workers on French mill-stones examined by Giesseler contained thirty-four per cent. of silica and ten per cent. of alumina. To these conditions the names of anthracosis, siderosis and chalicosis have been given. The inorganic particles are deposited in the upper lobes and around the root of the lung more than elsewhere.

"Cotton dust tends to a form of pneumonia; and Zenker found among cigar-makers marked atrophy of the lungs, together with deposition of brown organic particles, though whether any connection subsisted between the two conditions cannot be proved."

HEALTH IN THE HOME AND ITS SURROUNDINGS.

BY EZRA M. HUNT, M.D.

Whatever may be the extent and perfection of public health administration, as conducted by civil authorities, it will yet remain that the health of the people largely depends upon the sanitary condition of the house and immediate premises of the occupants and the sanitary care of the household. It will, therefore, be the design of this paper to furnish a plain outline by which the ordinary householder may know how so to regulate a house and its immediate surroundings as to make it promotive of the health of the occupants.

DRAINAGE.

In choosing or building a house the first essential is the securement of proper arrangements for the keeping of the *ground* under and about it in a condition favorable to health. This always means that there should not be such dampness of the ground as is caused by water stagnated in it or by a high water level.

There are some prominent reasons why a lot of ground that is to be occupied by buildings needs underdrainage.

There is no such purifier of ground as air. No ground is so solid as that there is not either air or water in the interspaces between the earth-particles. That this amount is very considerable you may easily test by filling a glass with dirt and seeing how much water you can pour in it. If the dirt is dry the amount of water that you thus pour in shows how much air was in the glass between the particles of dirt, for the water only takes the place of the air. If the ground is thus kept full of water it expels all the air except the little that mingles with the water itself. Now, we know that not air and water, but *cir-*

culating air and *circulating* water are the two great agents for keeping the ground in a condition favorable to health. We secure both of these by securing a low water level in the ground, so that air can circulate down to it, and so that the water coming from the clouds can also circulate in the soil and not find it already full of stagnant water. To accomplish this, deep underdrainage is often necessary. As the ground differs very much in natural degrees in different places, and as the soils and underlying strata differ very much, according to the geological structure and artificial additions, the depth at which it is necessary to lay tile in order to secure circulation in the upper ground and a low level of the ground water is very different. The farmer is not slow to find this out about his fields, and the builder who finds out whether he is building on clay, or gravel, or sand, or alternate layers of these or in a muck bed, is not slow to find out if he will. We knew a man who dug out a pond on a hill and built a house over it without any drainage except enough to carry off the standing water from the pond. It was a fine-looking house, but became notorious for chills and fever. We know an eminent engineer who claims that in most cities there is need of drainage to the depth of fifteen feet. This view is based on the fact that most cities are built near streams of water, where the natural water level is not very low; that as buildings shut out sunlight and air, evaporation goes on slower, and storm-water and the absence of prolific vegetation add to the ground moisture. This is all true. Many cities are now suffering from ground saturated with water more than from any other cause. This shuts out the air which would otherwise circulate and oxidize filthy matter and take care of it. It is wonderful what an amount of compost or organic matter the ground will take care of if only it can be allowed to have air in it and the water that comes from above circulating through it. But, if you shut these out, stop cropping the ground, and then by building on its surface increase dampness, you interrupt nature in one of its chief arrangements for health. Drains, therefore, ten to fifteen feet below the surface, are not extravagant for some parts of cities, but much will depend on the character of the soil. At any rate, no house should be built, either in city or country, until the builder has arranged to make the usual level of ground-water below the cellar, and many feet below the surface of the ground. Where the general water level about the house is high, it will often be necessary to have all the drain-pipes, under or around the building, converge to one general drain-pipe outside, which shall carry the water off to a lower level to a soil which is more

absorbent or a stream that will convey it away. It is also to be remembered that the level of dampness in the soil is above the level of ground-water, varying according to the character of the soil. For all soils are responsive to capillary attraction, by which the ground just above the level of complete saturation, is kept wet by the adjacent water. As drain-tiles are meant to take in water from the ground, they are not cemented as for sewers. Their size, the nearness of successive rows, the direction of outfall, etc., are all relative questions. Even when they are not filled with water they serve as air-tubes, and thus aid in the airing of the ground. We have seen one public alms-house in the State in which they were made to have openings on the surface on purpose to secure better soil-airing.

Many houses already built could be made much dryer and healthier by deep drainage about them. Others, where the ground is clayey or hard, could be helped by a substitution here and there of gravel and sand through the natural soil. All details cannot be here stated, but the householder who will keep prominently in mind the fact that only ground in which the water level is such as to allow the circulation of air beneath and around the building, is fit for occupancy, will find many things to guide him. If it is a place hard thus to dry, he will not pour the water from the roofs on this ground, or shade it with heavy foilage, so as to keep out sun and air, or otherwise embarrass a circulation in the ground, as important to its healthfulness as is pure air to his own lungs. In general, roof-water should not fall about the house, but be carried off. Sometimes, because we have not the means, or because our neighbor's lot is not thus kept breathing, we have to resort to various devices in order to secure dryness. The walls of the cellar are made so as to get air from the outside, as when an area is built about them, or they are built mostly above ground, or what is called a damp course is put in the wall. This is made by building a foundation of concrete or cement, and then putting one course or more of an impervious layer of slate, or cement, or asphalt, between the courses of brick or layers of stone work; also a double course of slates in cement is laid along the wall just above the ground line, or vitrified stone-ware perforated with holes, is sometimes used. If this is not done, in very damp ground the stone or brick often carry up the water by capillary attraction, so as to make the walls of rooms damp. The bed of concrete, or cement floors, used in basements, are an aid and are for the cellar and rooms above, what the damp course is for the walls. Stone and brick vary much in their degree of

porosity, and for foundations the best should be secured. Where we cannot wholly remove dampness, it is often best thus to cut it off. although we are to remember that we cannot wholly shut out ground air, and had better be radical enough to attempt to have it pure. The importance to be attached to the location of dwellings on *ground of circulation*, instead of on water-logged soil, has never been sufficiently estimated, since the vapors arising therefrom are too often laden with organic or specific disease particles, for which moisture as the carrier and the heat found in the dwelling furnish the disease-breeding conditions. This is all the more significant since now many diseases seem so intimately associated with low forms of vegetable or fungoid life. Ground thus becomes foul and is deprived of its self-cleansing powers, and its air is as prolific of disease as is the foul air of the sewer. Fungoid soils or localities are not good for building ground. Avoid a mouldy home.

HOUSE CONSTRUCTION.

The idea of a perfect building material is but an extension and modified application of the idea of a perfect ground structure on which to build. While there is more need of compactness in order that it may resist or accommodate itself to forces above ground, the idea of porosity or perviousness must be preserved. It must be material which admits of the circulation of air through it, yet in such a sieve-like way as not to cause draught. Brick, because it is a form of compact but aerated ground, and porous stone, because it is another form of earth structure, are valuable for this purpose. Some stone is so compact as too much to exclude air, and thus becomes too damp for building material. So walls may be painted and successively papered to an extent which makes them too impervious. The art of healthy house building is so to combine materials as to secure this properly distributed circulation of air, and if possible secure it at proper temperature, to govern the admission of light, as adapted to human beings, and thus follow out the natural laws which govern man in his relation to his inclosed condition, and the adjustments which within certain limits are allowable. But it is wonderful how wise it is for us in all artificial constructions to study closely the laws of natural philosophy, and not only conform thereto, but in deviations make our deviations on the basis of the law. It is of great import that now scientific tests unite with practical experience to enable us to decide many questions bearing on the welfare of life. We can accurately test the

quality of stone or brick, the angularity and quality of sand, the excellence of lime or cement, and whether the mortar is properly tempered. So brick, or blocks of terra-cotta, can be had of definite degrees of porosity, and even the various woods are closely tested, as well as the effects of varnish, oils and various paints. The right combination of materials to form a proper dwelling-house, as well as the right preparation of foundations, are well understood, but often greatly neglected.

HEATING AND VENTILATION OF HOUSES.

In the proper construction of a house so as to have a dry cellar and surroundings and dry walls, we take the first step toward proper heating and ventilation. Thus the circulation of the air is properly maintained in the inclosure and the dampness does not abstract the heat which is provided. In a house thus built the problem is merely that of bringing up the temperature of the air in the building without subjecting it to too rapid cooling from its surroundings. The demand for ventilation arises from the fact that rapid circulation of air is impeded by the inclosure, and that our own breathing and the lights and fires, use up oxygen and supply carbonic gas, while organic or decayable particles are also more or less furnished to the air. Air which has six parts by volume of this gas to 10,000 parts of air has reached the extreme limit for breathing purposes, not only because of the carbonic acid it contains, but because in human habitations this is denotive also of an amount of organic matter exhaled from the lungs which ought not to be again inbreathed. The expired air has five per cent. more of carbonic acid than the inspired, and has lost slightly more than that of oxygen. It also brings out with it a varying amount of gaseous and animal matter, quite decomposable. In order to dilute this or to drive it out, air must get in generally at a rapidity of not more than two and a half feet per second, since faster than this a draught is created which, except in warm weather, would be too much for most persons.

If the room is too small or too near air-tight, or has too many people in it, or one person in it for too long a time, or has other sources of air contamination besides the person, its air will become foul faster than it is possible to bring in fresh air without a draught. One lamp or gas-jet, or two candles in a room burn out oxygen and introduce carbonic acid gas as fast as a person, and most of our larger gas-jets or lamps are equivalent in this regard to three persons.

The foul air produced by lights has no organic matter, but it diminishes our supply of oxygen and so lowers vitality and often produces headache and weariness and ultimate ill health. The introduction of the electric light, which does not thus consume oxygen, will be of great service. Gas stoves with no chimney consume oxygen and produce carbonic acid gas rapidly. Iron stoves raised to a high heat not only do this, but when nearly red hot the gases inside the furnace are readily diffused through the iron into the room, and especially carbon oxide, which is much more injurious than carbon dioxide or carbonic acid gas.

The common fire-place helps much to ventilate a room, since it draws to it the air of the room, which causes fresh air to come in from without; while it thus heats the air of the room, it secures a supply. It is, however, very expensive if we seek to heat the whole room, since there is so much waste of heat.

Where a furnace is used, situated outside of a room, if it has a proper fresh air box, it supplies fresh heated air to the room. If this is brought in without dust or too much dryness, it is a good kind of heated air.

Where hot-air pipes are used they do not introduce fresh air into the room, but simply heat the air of the room, pure or foul as it may be, unless, instead of direct heat, these pipes are so arranged in coils somewhere as to allow fresh air to be introduced and flow over them and then flow into the room and so supply fresh air heated by pipes of hot air. For this method of indirect heating the pipes need to be kept very warm.

Hot-water pipes or steam-pipes are on the same principle, the choice depending mostly on cost or on some questions as to the degree of heat to be maintained in the pipes and the effect as to moisture, etc.

We cannot here discuss so broad a subject as heating and ventilation, but only desire to call attention to the principles on which it rests. By properly sustained animal heat resulting from food, exercise, etc., and by clothing, we are to accomplish most, and then supplement by these more artificial appliances. Pure air needs to be heated less than foul air, for it gives more heat-producing power to the system.

"In our best houses the question of ventilation hardly arises, unless under exceptional circumstances," but in crowded rooms or very close quarters, there is often need of artificial arrangement. Additional remarks on this subject, with special reference to school rooms, will be found in the Secretary's Report.

HOUSE-PIPES.

The modern house has come to be largely an inclosure of pipes—so much so that the proposition has been made to first draw the pipe plan of a house, and then construct the house in reference thereto. We have already noticed the under pipes which have to do with drainage. We have, also, alluded to some pipes which may be needed in connection with heating and ventilation.

The other series of pipes which have most to do with dwelling-houses are gas-pipes, water-pipes, and pipes for the conveyance of sewage. Although gas-pipes can only be harmful by reason of leakage of gas so as to contaminate the air, or so as to cause fire in case light comes in contact therewith, it is very important that there be no leakage. The pipes need to be of good metal, carefully joined, and the gas-jets, such as will fully prevent any escape. This occurs more frequently than is supposed. It is often well to try occasionally the jets when they are believed to be entirely turned off, and, also, to have the examiner of the gas-meter see that there is no escape. The gas-meter itself sometimes has leakage in or about it, and this adds to expense as well as fouls the air. It is best to have all tubing in a house placed so as to be as accessible as possible.

WATER-PIPES.

The water-pipes of a house are of still more importance. Where water comes to a house by pressure, whether by natural gravity, or, after having been raised by engine-power to a reservoir or stand-pipe, the pipes are kept full, and there is but little danger of contamination. Even lead pipes are not so susceptible to action when constantly kept full of water. Where intermediate cisterns or standing water, in any form, is kept, it is to be remembered that it is an absorbent of gases, and that water may be fouled by impure gases or by organic particles passing over it. Even where the water-supply is constant, cisterns for the water-closet supply are sometimes advised on the ground that thus the water is kept more distinct from the general supply, and with some forms of closets the amount of supply is more easily regulated. But if provided, such cisterns should not be left long without use, and should not be so large or so located as to allow the water to become stale or to absorb noxious matters. As most water is not chemically pure, there is often more settling and quicker

spoiling than one would suppose. There are many waters which are used for drinking-water, which, if kept a few days in a long glass tube half full and corked, will, on opening, emit much odor from the change in the suspended or dissolved ingredients they contain. All standing water needs to be aired, and is better off where a draught can reach it than in some pent-up corner, in cellar or closet or attic. The agitation of water also helps to air and freshen it. It sometimes happens in cisterns, over water-closets, that the pipe leading up thereto is empty, the valve being at the bottom of the cistern, and so it is filled with foul air from the closet. This is not completely washed or driven out by the water, but, at the raising of the valve, some of it gets through to the water, and may even bubble up in the cistern. The valve, therefore, should be close to the closet. If this cistern has an overflow-pipe, it must not run into the general soil-pipe, for if it does, when there is no overflowing water, it serves as a conduit for foul air. Even if there is a trap, the water in it becomes tainted or evaporated by long standing. It can be conducted to a water-leader or some other point.

Where the supply of water to a house is intermittent, so that the pipes are not always full, or, as is the case where a pump draws the water into the house, especial care must be taken. If the pipe is of lead, small particles may become dissolved, and even the lining with tin does not seem to remedy this. Lead thus introduced in the system is a great risk to health. When water-pipes are empty of water, they are occupied by air. Therefore, we must see to it that the air which gets access is not foul air. We have known a faucet thus to open directly over the sink connected with a soil-pipe, so that if the faucet was turned when the water-supply was not on, the tube would be filled with foul air. This mode of water-supply is not now common, but, as defective pumps are often located directly over sinks, it is well to bear these possibilities in mind.

SEWAGE-PIPES.

The most prominent and riskful kind of house-pipes are those which have to do with the delivery of the various liquid and floating materials from kitchen, laundry, wash-basins, bath-tubs and water-closets. These are the pipes intended to carry soiled liquids, the main or upright one being generally called the soil-pipe.

It may be said first of all, as a rule: Do not give them an undue

quantity to carry. There is such a thing as an unreasonable production of material, and a useless addition of water thereto. There is much of dust and dry dirt that should never find its way into the pipes, but into the fire. There is much stuff that properly goes with the garbage for punctual delivery and does not belong to the soil-pipe. Laundry and kitchen slop fluids can often be largely disposed of upon the lawn or around vines without inconvenience. Water, with all its value, may be wastefully used, so as to cause unnecessary dampness about a building, and so as to too greatly increase the amount of delivery through pipes. Where the dependence has to be on delivery into an outside cesspool, or for soil filtration, this is a matter of great importance. Many households use double the quantity of water used by others and make it dirtier without any corresponding increase in cleanliness. All introduction of rain or roof-water into the pipes is an undue increase of quantity, unless needed for flushing purposes, which is not generally the case.

GREASE TRAPS.

It often happens that entirely too much grease gets into the pipes. It is in some respects the most unmanageable of all the outgoes from the household. It does not dissolve in water. It does not submit to oxidation, as does most organic matter. Besides its mechanical clinging to the sides of pipes, it resolves into fatty acids, which are as pernicious as the grease itself. The same is true of soaps, which after their use not only lose their cleansing qualities, but become sources of pollution. This class of products is much more easily handled by ground admixture and by chemicals than by suspension in water, or even in air. So often does the grease clog up pipes as used even in small households, that it is necessary occasionally to thoroughly scald out the house-pipe and make free use of soda, potash, or other alkali. More than any other one ingredient, it is the cause of that peculiar odor so characteristic of sewers and generally known as a sewer-gas smell. Where there is much grease, it should be removed by mechanical or chemical means before going into the pipes.

For this purpose it is usual to have what is called a grease tank or grease separator, made variously of brick, stone or vitrified earthenware. The design in these is to give the grease time for cooling and so to construct an intermediate trough or sink between the house and the delivery pipe as that the grease may rise on the top, to be occa-

sionally skimmed off, while the outflow takes place from nearer the bottom.

There are many special forms, such as that of Doulton, Carson, and the Tucker grease separator or cooler. The most feasible chemical method is probably that by the use of carbon bisulphide. (See Spon's Ency. Arts and Man., Vol. II., page 1455.)

It is some advantage to have the urine flow into the soil-pipe above the dish-wash, as it aids to clear the pipes of grease.

Thus having diminished the quantity and improved the quality of the sewage within reasonable bounds (most important where there are no sewers and not unimportant sometimes with these), the principal fact as to the removal is that it ought to be made *while the material is fresh.* This means that all particles of matter that are to be added to the house sewage, should be added before there has been decomposition or decay, and that soiled waters, such as laundry-water, slop-water, etc., should immediately after use find their way to the pipes and out of them.

The rule is that, in a health-preserving or disease-breeding sense, no such liquid or offaling is objectionable until from twelve to eighteen hours after its production or voidance. Hence, all arguments as to the insanitary effects of its handling, or of its conveyance to rivers, are futile, if only you insure prompt delivery. To call it *filth*, in a disease sense, at the start, and to argue against its conveyance because it has odor, or because, by detention, it becomes pestiferous, is no more reasonable than to judge tomatoes unwholesome because decayed tomatoes are sickening. This point is important to be made, because so many arguments as to river pollution, or as to the evils of other transportation and delivery of sewage, are based upon the assumption that fresh sewage is unsafe. It is only unsafe to those who store it, or who do not succeed in getting rid of it before it becomes stale. The one center problem to solve in house-drainage is, how to get clear of fresh sewage through pure, clean pipes.

All matter that is to be carried by the house sewer system, having thus been introduced into it, in quantity, quality and method, as is best, the next question is as to the construction and relations of the pipes which are to carry it. Were it not for frequent errors, it would go without the saying that these pipes must be of such make and joining as will most completely conduct all that goes into them out from the house. This means that there must not be such roughness of surface, such smallness of calibre, such sharp points or quick turns, or angles,

as would either leak foul air, catch particles, or interrupt swiftness of flow; that they must be of such metal, and of such uniform thickness, as to allow no leakage of any gas, and that they must have proper fall.

Experiments now tell us just what these proportions are, and proper skill can construct and join tubes precisely in accord with these requirements. The next principle is to adapt the size and shape to the stream to be carried, so that, by this proportion between quantity and calibre, the current shall aid the fall to give such flow as shall be sufficiently rapid and self-cleansing. We must provide enough calibre of pipe to prevent clogging, yet not so much or so confined a space or chamber in the unfilled part of the pipe as shall be a receptacle for foul or stagnant air. It is to accomplish this that now smaller pipes are advocated than formerly, and that they are often made of the shape of the small end of an egg at the bottom so that the stream is made deeper and more compact, and thus a greater current is secured. The perfect pipe would need to be so smooth as to have no obstruction and the least amount of friction of surface, and to flow just full all the time, light and air having free access to the surface of the flowing sewage. But as, for many reasons, this is not always feasible, we must make the nearest approach we can by adjusting the shape of the pipe to the varying current, by making the whole pipe no larger than is really necessary. Next we must so construct the pipes as to admit currents of air, and give air-flow and flushing at such points as will not let out any of the flowing liquid, but as will let in good air and let out any possible foul air, at places convenient and not hazardous. And one great value of such a system is that there is very little, if any, hurtful air to let out.

The idea is, first, to have all material passing through to be the fresh soiled water before it is disease-breeding; second, to utilize the water, not only as a carrier to take it out of the way, but so as, by its own air, its own running action and its ability to suck up air along its surfaces, to secure oxidation or change of organic matter, whether in suspension or solution; and third, so to allow the free play of air through the pipes, as that it may both furnish this supply and do its own direct work in this same process of oxidization and healthy decomposition. When sewage is managed and conduits arranged on these principles, with the exception of the often unavoidable absence of light, we get the benefit of those chief principles upon which the safe conveyance of sewage must depend. As the soiled liquid runs along the pipe, the shape, size and velocity of the stream aid as a flush, while, at the same time, the

movement helps to appropriate the air that is available, to secure oxidation and other changes of the floating particles. If, by a flush-tank or other means, the liquid is made to flow in gushes instead of a small stream or in driblets, there is more flush and more suction of air.

Besides the presence of pure air, it is desirable that it be so introduced as that it may circulate. Indeed, without this it cannot maintain an average of comparative purity. It is better still if some rapidity of circulation can be secured, and, at times, the air be made to flow rapidly through the pipes. Very often, with a view to this, an opening is made by extending the soil-pipe to the roof, open at the top. But, *as it takes an opening somewhere below, as well as above, to make a current*, it must be remembered that this one opening, while better than none, is not enough. Again, the opening or openings are often made too small, and, although serving as *vents*, or to prevent pressure of gas and syphonage, they do not serve as real ventilators, or air and wind circulators. Hence, it is now a rule in the best constructed systems of house-sewage delivery, to have the main soil-pipe of the house run out open through the roof; and, *also*, just as it leaves the building to join the cesspool or sewer, to have another opening or outer stand-pipe connecting with it, and nearly as large in its diameter, which shall let in or out the air, and thus secure free circulation through the house soil-pipe system. With the main soil-pipe thus running through the house, *having an opening at each end for air, and no intervening trap*, we have facility for the entrance and exit of outside air. The temperature of the air outside and inside is generally different, and somewhat different at different points of the pipe in the building, and thus circulation is maintained. There are some physical laws as to the motion of air in pipes, as to the influence of heat, of friction, of currents and counter-currents, that may still admit of more accurate adjustment. But as a fact of actual test, it is found that soil-pipes thus constructed, as a rule, secure for themselves a circulation that purifies the air of the flowing sewage. The pipe that ends above the roof should be high enough not to be covered by snow, should have in it a wire ball to prevent leaves getting in, and, if having a hood at all, should have it so high as not to interfere with free circulation. As to the opening in the soil-pipe, at its lower end, where the soil-pipe emerges from the building, most prefer to carry a pipe or leader from it up to the roof, although many claim that house-pipes thus aired and cared for cannot produce spoiled air, and so may be allowed to end near the ground. Where the house is very large,

and the pipe system has many connections, it is best to have more than one roof opening. It will be perceived that such a system excludes all traps from the main inside soil-pipe, as these would interfere with the circulation of air.

TRAPS.

But if we are thus to leave the soil-pipe or main house-sewer without any traps, where, within the building, will you have traps? Now and then a good authority says, "nowhere." Such say that a well-managed system of this kind will be kept so pure that there can be no foul air to come into the house or to be produced in it, and that additional free circulation is had through the connecting pipes by having no traps under wash-basins, closets, sinks, bath-tubs, etc. Most authorities, however, say that, for fear of some such air, it is best to have the usual water-seal or trap under the basins, closets, etc., quite near to them and before their own short pipes join the main soil-pipe; also, *to have, just beyond the bottom outside opening of the main soil-pipe*, a trap beween it and the cesspool or sewer, so as to have a good guard against any foul air from these. A perfect system of sewer or cesspool will also have ventilation of its own for itself and its pipes. Thus, just as the house has its soil-pipe ventilated by two openings, with a cut-off trap between it and the sewer or cesspool, the sewer or cesspool should have its opening with the same trap serving as a cut-off from the house system. Thus the attempt is to keep each pure and so far independent of the other as that the condition of the one shall not contaminate the other. But as you may not be able to control the outside system, have, at least, the inside system well ventilated and separated by the exit trap. If the reader will get clearly in mind the principles of house arrangement thus laid down and explained, he will be able to estimate what methods should be adopted. Many connect the water-leaders of the roof with the house system, and use these as aids to the ventilation. This does no harm, unless it is unwise to let so much water go into the cesspool or sewer, or unless the rush of water may sometimes be so great through them as to syphon; *i. e.*, discharge the water from traps, and thus render the house, for the time, open to sewer air, if there is any; also, where roof-leaders connect directly with a sewer, while they help to ventilate it, if any side-leaders enter from piazzas or lower points, these may make open conduits for foul air too near

windows. But in such a system there ought to be no foul air. We thus hope to have made plain the most that relates to the general system of house delivery of liquid sewage.

It is often asked under what circumstances a trap may have the water forced out of it and cease to be a trap. In other words, *how is the risk of syphonage to be avoided?* When the pressure of air is removed from a trap so that the water is forced out of it, it is said to be syphoned. The water being removed, the trap is unsealed. This may happen under two sets of circumstances: First—Water flowing into the same pipe from fixtures above it, by the momentum of the stream and the air draft it makes in connection with the column below the trap, may remove the air pressure, and unless some water follows it more slowly, leave the trap empty. In this case, the weight of the column of water so removes pressure as to take the water from the seal, the air draft aiding in the effect. Where the distance is short or the trap is so as not to receive the full weight of water, it is not likely to occur. Second—These side traps of connecting pipes may be syphoned by the full and rapid flow of water through the main or soil-pipe with which they are connected. The air between the soil-pipe and the side trap is thus sucked out, and, as a consequence, the water in the trap follows it. A dash of water through a soil-pipe is not likely to syphon such traps unless they are very near, the pipes and the traps small and the soil-pipe is running full.

It must be admitted that practically there are found to be many variations of effect according to the whirl or direction of the water, the fall, the temperature of pipes, etc., so that there is much difference of opinion as to the liability of syphonage. This is one of the reasons why more dependence should be placed on flushing with water and air, and having pipes in all respects right, and the air pure, than on the trap alone. It is usual now in the best arranged systems to provide against the possibility of syphonage, by having a small vent-pipe pass from the "crown" or top of the trap nearest the outlet up or out to the air. Thus either air is let in so as to prevent syphonage, or if the water is carried out of the trap by the force of a descending stream in the pipe, enough water runs up the vent to fall back into the trap and continue the seal after the stream has rushed by. As to the size of this vent, "it is not safe to trust to a vent-pipe of less size than that of the trap it is to serve, until we get above two inches diameter, except it be of only a few feet in length" before reaching the outer air or joining a larger vent.

While we believe the risk of syphoning traps where the soil-pipe is ventilated on the roof and at its exit from the house, is often magnified, those who construct house sewage systems should fully understand the possibilities and the modes of protection. If the traps are near the basins or closets and are shaped and set so as to have from one and a half to two inches actual seal, and the soil-pipe is so ample as never to flow entirely full, syphonage is not likely to occur. Where, as from a bath-tub, there has been a full, sudden rush of water, it is well to allow a half-cupful to run down just as the flow is ceasing. It is claimed that some traps, like the Bower or Cordell, are not as easily syphoned as the *S* trap, which in general is in approved use. Some now claim that it is better to have the trap so near the basin that one can look down into it and see whether the water is in it.

In houses already constructed it is often not feasible to introduce a vent system of pipes for all traps. In these the round or bottle-trap (unpatented) can be safely used, except that it is to be remembered that by its shape it gives too much room for the settling of filthy particles, and should be accessible for cleansing.

There is but little danger of syphoning the trap of the outlet-pipe as it goes toward the cesspool or sewer, if it is of good size and has the outside ventilating-pipe before referred to. While questions as to the possible syphonage of traps must generally be submitted to authorities, with all the actual facts of size, locality, etc., given, these directions will aid those who wish to know when to seek for special advice. We claim that notwithstanding the number of defective house systems, it is now possible to build healthy houses with all the modern improvements. But it is to be remembered that this is skilled work, that there is sometimes need of cleansing of such apparatus, as well as house-cleaning in other particulars, and that an annual inspection of all plumbing work is desirable. Because it is thus possible, it is not, however, best to have pipes ending in each room, but to locate the bath-room, basins, etc, in one well-aired, accessible room, well located for light and ventilation.

DISINFECTION.

We have already, in former reports, said so much on this subject (see Third Report, pages 68–83; Fourth Report, pages 260–265,) that but little needs to be added here. Where any odor is perceived from a closet or other appliance, sulphate of iron, (that is, copperas or green

vitriol,) dissolved in water in the proportion of two pounds to a gallon, is most available to be thrown down the receptacle just after the rush of water, and so that some of it may remain in the trap. Various other articles, named in former reports, may be used in the same way. Borax is a good material with which to scrub out all fixtures. All places that are accessible to soap and the scrub brush should receive the occasional use of the same, since even air and flushing does not always remove or neutralize each organic particle. All those water-closets known as plungers, or which have a handle to raise, should occasionally have the top unscrewed and the side chamber thoroughly cleansed.

HOW TO TEST THE HOUSE SYSTEM OF SEWERAGE.

Various methods have been devised, but the water test, the peppermint test and the smoke test are the most prominent.

The water test is founded on the very proper assumption, that if the outflow is stopped by a valve or other device, and the pipe filled with water, it will continue to stand at its first level unless there is a leakage somewhere. The difficulty in applying this test is that it is not always easy to plug up the outlet, and that the level of the water rising in connecting pipes is not always situated so as to be convenient of inspection. Yet there is no reason why, occasionally, or because of suspicion, the fixtures may not be so loosened or put aside as to expose all connecting pipes above their trap, and the outside pipe be plugged just before it comes to the outside ventilator and trap. Then the highest horizontal pipe being kept for observation, the whole pipe system, when filled, should preserve its level. This, if showing leakage, unfortunately does not show locality, unless each series of pipes is tried separately. Where the traps have vent-pipes these also complicate the trial. It is, therefore, chiefly applicable to some main or continuous pipe that needs testing. It is exceedingly desirable that, as far as possible, all house soil-pipes should be out of the wall and exposed, as thus any leakages can be detected.

The two commonest tests are those known as the *peppermint test* and the *smoke test*.

"The smell of peppermint is well known, but probably its excessive pungency when in the form of the oil, and when brought into contact with hot water, is not generally understood.

"If such an excessively pungent mixture as this be introduced into

the drainage system of a house, even the smallest leakage will become evident. Suppose the least possible defect to exist in any joint of any of the pipes, a strong smell of peppermint will be evident near the defect. The only difficulty is finding a place to introduce the peppermint. It will be quite evident that it is no use to pour it into any of the appliances in the house, as, were such done, this smell would so rapidly permeate the whole of the premises, by way of the staircase, passages, etc., that time would not be allowed to detect the leakages. Some means must be discovered of getting the peppermint in from the outside. This is not always possible, but generally it is. In the case illustrated there would be no difficulty. The rain-water pipe at the back admirably suits the purpose. One person gets out on the flat roof, near the top of the pipe, and provides himself with peppermint and four or five gallons of water, as near boiling as possible. Meantime, all doors and windows are closely shut, and persons are stationed about the house to observe if the smell expected becomes evident, and to locate, as far as possible, the point from which it issues. The man on the roof pours about half an ounce of the oil down the pipe, and follows it with the hot water. He need then retreat from the place a little, for the peppermint-laden steam which will come from the pipe is blinding in its pungency. As soon as possible he plugs up the top of the pipe with a towel, or some such thing, to prevent the occurrence of the vacuum which would otherwise be in the pipes, and which would tend to draw air from the house into the pipes instead of from the pipes into the house, at any leakage. It would probably not be a minute before the people in the house would perceive the smell at various places. The manipulator of the peppermint must remain perched on the roof until those inside have had time to make their observations, otherwise he will infallibly bring the smell with him."

The test described is an excellent one. It is searching and is simple in application, but it has one drawback. It is impossible by means of it exactly to localize a leakage. This drawback does not apply to the smoke test, as made by a smoke machine. This is nothing more nor less than a centrifugal pump attached to a vessel for generating smoke. The pump pumps smoke out by a pipe, which may be inserted in any pipe in direct communication with the drain, or in an aperture made for the purpose.

The test is in all respects similar to the peppermint one, excepting

that the leakage is not smelt, but seen, and, as we all know, seeing is believing.

After the test has been performed the drain may be opened. This may be done by breaking into a pipe in front, by breaking off a collar, or by punching a round hole in the pipe. In any case it will be possible to judge much of the condition of the drain by the manner in which water runs through the pipes. If we have discovered that there is sufficient total fall, we can now see whether or not it is uniform. We shall find in a few cases out of every hundred examined that there is a total stoppage, that no sewage whatever leaves the premises, and that consequently it must all be depositing under the basement.

If the drain, after all tests so far applied, and from what can be seen of it, appear to be in good condition, it may be further tested by filling, or attempting to fill, it with water. There is probably not an average of one drain in a hundred in old houses which would remain full of water for an hour. For the rest it is necessary to examine all appliances, to trace the pipes from them, and sometimes to test these pipes.

OUTSIDE DISPOSITION OF LIQUID REFUSE.

We have thus far considered the relations of buildings to the modes for the delivery of liquid household refuse up to the point of their leaving the house through conduits or soil-pipes, separated from the outside system by a good trap or water-seal, with a ventilating opening or pipe from this house sewer on the house side of the trap. Thus you have devices by which whatever may be the condition of outside sewers, cesspools or places of deposit, it is hoped that there will be no pipes leading the foul air into the house.

Yet it is to be borne in mind that the most radical and defensible method is to have no foul air kept or generated outside which can be brought into the house.

It is also to be remembered that independent of pipes, if the cesspool or the ground near the house is being contaminated, air direct from there finds its way into the house, mingling with the general air, and thus furnishes devitalized and devitalizing breathing material. Also, if there is a well or ground cistern on the premises, the water may be contaminated through this air, or through more direct contamination in the ground itself.

If all the liquid material is carried directly to a sewer by a ventilated

and smooth and fairly self-cleansing pipe, with proper fall, the problem is simplified so far as the individual house is concerned. It is insisted that all pipes under the building be of iron, and that those between the building and sewer be of the best vitrified pipe, so laid and so joined as to make them absolutely water-tight. If one can have full security that such pipes shall be of best quality and construction, and shall be properly laid, they are as durable as iron pipes, which, notwithstanding coating, become roughened and rusted, and are then less lasting than the best stoneware or vitrified fire-clay pipe.

Too often the iron pipe, where it comes out of the building and is joined to the vitrified or stoneware-pipe, *is not well joined*. It should not depend upon cement, but have caulking with tarred gasket, so as to fit the socket tightly. The plan adopted by Engineer Philbrick in laying the pipe for Princeton College, so well expresses the kind of work desirable for all outside soil or sewer-pipes, that we quote his outline:

"SPECIFICATIONS FOR LAYING STONE-WARE DRAINS.

"MATERIALS.—No pipes should be used which are not nearly cylindrical, a variation of over one-fourth of an inch in the different diameters of a 6-inch pipe being enough to condemn it.

"The pipe should not have bells or hubs attached, as is now generally done, but should be formed in simple cylinders, the joints being covered by loose rings or collars of the same material, without glazing, to be broken in three or more pieces when applied.

"The thickness should be uniform and not less than [illegible] and [illegible]-inch for 5-inch and 6-inch pipe, respectively.

"The glazing should be '*salt glazing*,' and not '*slip*' or *clay* glazing, and should extend throughout the whole interior, but should be omitted on the collars and on the outside of pipes for 1½ inches at either end of the pieces. If the ends are glazed outside, the cement used at the joints does not adhere well, and the joint may be leaky, even with good cement and put together with the best of care.

"The clay of which they are made should, of course, be of good quality and well burned. Less trouble, however, is found in practice with the kind of clay than with the results of careless moulding, such as oval, crooked pipes, with glazing applied all over the ends, for no better reason than because it costs some trouble to omit the glazing there, although it is a positive injury.

"The cement should be of any good brand, of fair hydraulic properties, fine and freshly ground, and carefully mixed with not over its own bulk of *clean, sharp* sand. In all places where the sand is not clean (it should not soil the hands when rubbed between them), it should be washed thoroughly in a bed not over six inches deep with

a copious flow of water, stirring the sand and water quickly with a hoe and allowing all the loam and clay to be carried off, till the water ceases to look muddy. The sand should be then dried and mixed thoroughly with the cement before applying any water. When wetting it for use, no more water should be used than is absolutely necessary to render the mortar plastic.

"It should be wetted only in small quantities for immediate use. All lots left over an interval of half an hour, or long enough to stiffen and begin to 'set,' should be thrown away and not 'tempered up' as is generally done for indiscriminate use. Cement when rewetted after a partial set, is sure to shrink and crack when it hardens, and is worthless for pipe laying.

"The ends of pipes and insides of collars should be wetted in warm weather before applying the mortar to these surfaces. If applied dry, the porous pipe absorbs the water so quickly from the mortar that it never hardens properly, and does not adhere to the pipe.

"WORKMANSHIP.—Pipe should be laid with such good alignment that the inspector can see through every section, like a gun-barrel, from one man-hole or lamp-hole to another, or from house to sewer. This can readily be done with very little extra cost, if pains be taken to pursue proper methods.

"Every piece of pipe should be bedded in cement mortar through its middle portion as well as at its ends, leaving no voids longer than the inside diameter of the pipe between these bearings. The lower half of the pipe should be carefully aligned with its neighbor, by applying a straight edge inside when bedding it, to avoid offsets at the joints, leaving slight inaccuracies in form to be developed at the top of the pipe, which is rarely wetted by the flow.

"Through every piece of pipe as laid should be passed a cord, made fast where starting, and extending through every section of pipe laid, by means of which a wiper or rubber disc between two smaller wooden ones, can be pulled through the whole section before leaving it for a night. Of course the mason is expected to see that every joint is clean as laid, but human nature is fallible and can't be trusted to remember this, the consequences of such neglect being often a total failure of the drain.

"Every section should be covered about three inches with fine earth, and tested by some two or three feet of water pressure, when the defects will be seen and may be remedied before filling the trench. The best masons will be astonished to see how many leaky joints they make unawares, and which may never be detected in any way but this.

"The back filling should be applied with care, packing the material around the pipes without moving them on their beds even a hair's-breadth. The trench may be puddled with water if it is at hand, taking care not to wash the cement when applying it.

"No good drain can be laid on a yielding foundation. No matter

what the material may be, it will break and make leaks when settlement occurs, for though the drain itself is light, the material over it is heavy and crowds it down as it settles. All drains on newly-filled land should be treated as temporary works to be replaced when the settlement is finished.

"After many years of experimenting, I have arrived at the conclusion that all stone-ware pipes should be laid by none but first-class workmen, and even then the work should be tested by slight hydraulic pressure before it is buried deeply, so that defective joints can be readily seen and made good before filling up the trench."

There might be slight variations of preference among different constructors, but these are the guiding principles. And it needs to be borne in mind that ordinary masons or builders do not conform to these plans, but assume that the work is to be done much after the manner of ordinary brick-laying. Just as an architect is employed to superintend a building and see to the fulfillment of the specifications of a contract, it is desirable that some one who has made sanitary art a study, should superintend such work; all the more, because so much of it is to be buried out of sight, where defects cannot be seen, and are often discovered only because sickness and death have openly manifested them. All *pipes and all sewers that are intended to convey foul* liquids must be water-tight, or hermetically sealed, except at points of ingress and egress, where intentional openings are made for ventilation.

A house-pipe should enter a sewer as far above the general level of its flow as the fall will permit, and in the direction of the sewer-flow. In order to prevent a back flow in the pipes, they should also enter a cesspool not far from the top. If, as there should be, there is a trap in the course of the pipe leading from the house just near its exit, there should not be another trap as the pipe enters the sewer or cesspool, since this would make a space of confined and unventilated foul air between the traps.

Should *the sewer or cesspool* be ventilated? The principle that we have advocated for all house soil-pipes applies exactly to all sewers and cesspools and their pipes. The sewer should have its ventilators generally not over 300 feet apart, and regulated as to size, frequency and locality by various considerations. Sometimes they may, especially at the beginning and the end, be carried up by the sides of trees or houses. Details cannot be fully given without knowing all particulars, but with these the principles of ventilation are generally easily carried out.

Where a cesspool is used, the ventilation is more directly under the control of the owner. From the first frost of fall to the last frost of spring, almost any ventilation that does not admit increase of liquid by rains, etc., will suffice.

A system of ventilation which is all-sufficient is made by having four pipes of not less than four-inch calibre running on a curve out near the top of the cesspool to a little above the ground, where each may have either a wire ball or movable cover. These serve to pass the upper air through the empty part of the cesspool, and so secure the dilution or change of any gas that may arise. These may enter the cesspool at varying and convenient points below the top, but all of them a little higher than the pipe by which the liquids from the house enter. The cesspool should not be so covered over with soil as not to admit of examination as to the height of its contents.

Where two or more successive cesspools are built, the one to receive the overflow of the other, the connecting tube is sometimes so arranged as to help the ventilation of both by having ventilating holes along its course. Because of imperfections it is generally safe to have all ventilators end by a tube up into the air.

Under what circumstances may cesspools be used? The reply of some of the very best authorities is, never. Such assert the principle that it is never wise to store filth, and therefore it should never be done. To this a reply is, that, with all the proper conditions given and specified, it is possible and feasible to store these liquids safely for a time. The answer to this again is, that the practical difficulty of securing the carrying out of such conditions is such that, in ninety-nine cases out of a hundred, absolute safety is not secured. This is too true, but does not vacate the propriety of stating what these conditions are. In order to arrive at these, we must state how cesspools are to be built, if at all, what are the risks, and what the best protection from these. The first question that arises is, shall the cesspool be so built as to allow part of its liquids to leak out at the bottom and sides, so as to leave only the undissolved matters, and so as not to need frequent emptying; or, shall it be built tight, like a cistern, and to be cleaned out as it becomes full?

If a spot can be found at least 100 feet away from your own or your neighbor's well and from the house, if the water level of the ground is low, so that it has much air in it and can receive the liquid slop as it leaks out of the cesspool, and if the soil is a gravel and

sand or a light, clayey loam, admitting of good percolation or soakage and cultivation, it is possible to have such a cesspool.

It should be made of even surface, should not go down deeper than the usual water level, and should be large enough never to be filled within a foot of the top. It should be well covered, so as to protect it from solar heat, yet by a stone cover should admit of inspection, and should be cleansed in early spring of all its contents. Three or four pipes of tile, coming out from about eight inches below the surface and opening on the surface, will ventilate it better than only one. Some, during the summer, would hang a wire netting of powdered charcoal just under the cover, but this is not generally necessary. Where there is need of a curb or lining, bricks loosely laid are best, and the cover should be an arch or stone. Occasionally such cesspools are well kept, and with no reason to suspect evil consequences therefrom. It is only because of nearness to water-supply or house, of neglects and of close vicinage, as in cities, that they are to be condemned. It is because the necessary accumulation of these in cities vacates the conditions of dry, well-aired soil, admitting of percolation and proper disposal, that they are ill adapted for city use. It is because they are so often made in a silly way, and so often neglected in the country, that they too often become disease-breeding nuisances.

It should be a rule not to make them very deep. Ground within four or five feet of the surface deals with refuse far better than earth deeper down. The air more readily reaches it, the growing vegetation appropriates it, and so it comes more within the reach of the conservative processes of nature. If tile-pipes a few inches from the surface run out in every direction, so much the better. The only exception to preference for superficial cesspools is where, by going deeper, you penetrate a clay bed, and strike a gravel or sand bed which is more porous and so removes it, unless, at the same time, you strike the water level.

While cautioning against the use of such cesspools, we desire that when used they shall be of the best kind and properly kept and cleansed.

Because of the possibility of a filth soakage which might contaminate the ground, or the water, or the air, where cesspools must be used, it is more usual to advocate those built after the manner of a cistern, thoroughly and smoothly cemented on the bottom and sides, and so provided as tight receptacles, to be emptied when full. The rules given as to the connecting pipes and ventilation, are the same in

regard to these as to the uncemented cesspools. But as no demand is to be made on the soil or ground, the locality, depth, etc., may be to suit the owner.

These tight cesspools always need to be watched, so that they shall not be allowed to overflow. It is better also, if possible, that they be not emptied by small and continuous pumping which agitates the mass, but by some form of odorless excavating apparatus, which quickly removes contents and admits of more thorough cleansing and disinfection. Some of the foulest arrangements to be met are closed cesspools, often made of planks driven down, which, from day to day, are being emptied by common pumps of their decomposed and putrescent liquids. Where cesspools are used, they should be made sufficiently large only to require emptying in the early spring and fall. Such cesspools should have at least two stand pipes for ventilation, of unequal heights, and of not less than four inches diameter.

Non-ventilated cesspools have given name to two forms of disease in Paris: the one a form of asphyxia, caused by sulphuretted hydrogen; and the other an inflammation of the eyes, caused by the ammonia in the foul air.

Where there are no public sewers, and owners of property are unwilling to have cesspools, two other forms of disposal have been successfully tried, each depending on soil disposal. One process of preparation is as follows: The small plot of land adjacent to the house is first thoroughly underdrained, so as to secure for it the lowest possible water level and the quick subsidence of all rains from its surface. This is done by close, deep laying of drain tiles in the usual form. These should generally be laid a little time before others now to be described, since thus the ground is allowed to become fully settled. Surface-water is kept off of it as much as possible. Next, another series or system of tiles is laid in a way quite similar, but of less size, nearer to the surface, and for a different purpose. The design of this system of pipes is that they shall be as near the surface as frost and surface-flowing or spading will allow, so that the liquid slops can flow through them and soak into the drained soil, and be appropriated by well-cultivated grains, grasses and croppage upon the surface. It is surprising, if these two ideas are well carried out, how much of the liquid and its organic particles can be thus disposed of. But there is one other condition: This slop must not come dribbling along the pipes just where it will, but must be received into a little tight cistern, called a "flush tank," so arranged as that it will, when about full,

each day, send out its contents with a gush through these pipes, and thus leave them a part of the time dry or vacant for the circulation of the air. It is easily arranged that this tank shall, at a certain height of the liquid, discharge itself, and also that it may discharge one day into a certain portion of the pipes and another day into another portion. It is found that thus a far greater quantity will be appropriated and nuisance from it prevented. Even the more solid matters, except such very coarse portions as are detained by a cleansing wire, become macerated, and afterward dried out and taken up from the small pipes by the growing plants. In Orange, in Princeton, and many other places, this plan can be found in successful operation. Most of the pipes do not need to be over two inches in calibre, and should not be more than from eight to twelve inches beneath the surface. While the persons putting down and overseeing such a system must understand not only its construction, but the necessary relative conditions as to soil and high culture, and closeness of plant or putting down, it is a feasible and satisfactory plan when well devised and superintended.

The next plan is that of modified *surface irrigation*. It, like the former, is based upon the idea of "intermittent filtration of soiled liquids" through the ground. By its structure, its air, its croppage, and its *alternation* of supply, the earth or soil can appropriate much floating or liquid material.

In this method, there should be under-drainage as before, but instead of the second series of pipes, reliance is had upon surface methods. Series of superficial trenches or furrows are made lengthwise, which run up to a long furrow parallel with the rear of the house and made to receive the liquid outflow. This can, if preferred, be made of galvanized iron, with movable outlets opposite each furrow, so that the contents can sometimes flow out some of these furrows, and sometimes at others. If so it should be cleansed occasionally with some one of the liquid disinfectants named in our circular. As the liquid is not intended to overflow, these furrows can be kept covered with boards if preferred. Here the liquid slop of each day is received into this long gutter, as in the former instance it was into the "flush tank." But now it is allowed to flow out by surface instead of sub-soil methods. When this is well managed, a small piece of ground with heavy grass, or with Indian corn cultivated as for fodder, or with vegetables, will dispose of very much soiled liquid. It is not found offensive, as is apt to be imagined, and is at least applicable to many country houses. The furrows can be changed from

year to year, and if the ground is thoroughly worked and aided with lime or other inorganic fertilizers, it thus disposes of the refuse. Without indicating preferences, which must often be relative, and must depend on the facilities and on the exactness of administration, we thus plainly indicate the most common and available means for dealing with the soiled liquid sewage of the household.

MODES AND PLACES OF INTERMENT.

BY DAVID WARMAN, M.D., TRENTON.

The disposal of the dead is none the less a sanitary question than the care of the living. Disease and pestilence are recognized evils. Whatever contributes to produce them must, if possible, be removed. We know that pestilential influences arise from various causes, and we provide against them. Much has been written upon the subject of contamination of the air from sewer gases and pollution of the soil and water by cesspools, and kindred topics, but a comparatively limited amount of attention has been given to the interment of the dead. It seems, therefore, imperative that a knowledge of the modes of burial, and the dangers that may arise from the improper disposal of the remains of our beloved dead, should become more extended. The experience of the past shows the importance of the careful consideration of this subject. The welfare of the living must not be lost sight of, while all proper respect is shown to the dead. The question of how and where the dead shall be disposed of, is one that is eminently sanitary. The dead should be so buried that the living may not suffer.

The disposal of the dead has varied at times, simply from fear of desecration of the grave. In the time of the resurrectionists, many bodies were buried in quicklime, and a resident of Dundee was so fearful lest the coffin of his child should be disturbed that he arranged an explosive apparatus, which was buried with the coffin. The methods in modern use are, as every one knows, first, intramural and extramural; second, cremation. The latter method is the burning of the dead.

This very ancient method of disposing of the dead has in modern times been, to a certain extent, revived. In England a society has been formed to introduce the practice, and in Germany cremation

has also made some progress. It has also been used to a limited extent in the United States. The serious and almost insuperable objection is the facility with which cremation would conceal certain crimes, such as poisoning, and render identity in other cases impossible. Cremation has not been accepted in this country, and there is nothing to deplore in the fact. It can doubtless be a useful mode of disposing of the dead in many cases, yet we do not think that either sanitation or sentiment demand it; and in many parts of the country it will be a long time before it can be made practicable or economical.

The other method, of intramural and extramural interment, or the enclosing of the dead in a grave, either within cities or beyond their confines, is generally adopted by all civilized races.

There are few countries where more excellent regulations relating to burial grounds and the interment of the dead exist, where the ceremony of burial is conducted with more propriety, and where greater respect is paid to the deceased, than in our own land, yet in some particulars improvement might and ought to be made.

The history and condition of burial grounds and the regulations for the interment of the dead, are intimately connected with the public health and should form a part of the sanitary regulations of every city and town. We can in this connection notice only some general matters which the subject suggests.

There are two principal objects which should be kept in mind, in these regulations: first, to pay proper respect to the dead, and, second, to protect the health of the living. To accomplish this there are several matters to be considered. The first important lesson for us to learn is, *that the dead and living were never intended to be brought in close proximity.*

That interment or enclosing the dead in a grave is a most ancient custom there cannot be a doubt. Amongst the ancient Jews, to have no burial was reckoned among the greatest of calamities. The exposure in any manner of their dead (even criminals) was looked upon as a pollution of their land. The Egyptians and Asiatics practiced interment from the beginning of time. Subsequently it became the custom to burn the bodies of the dead. By Homer's description of the funeral of Patroclus, it would appear that the Greeks used burning as early as the Trojan war. They also had recourse to interment, as seen by their historians, who give an account of the manner in which bodies were placed in the grave; Plutarch tells us they were laid with their faces toward the east or towards the

west; and Cicero informs us that, in early times, as those of Cecrops, interment was altogether made as by the Greeks; but we have ample testimony, in history, that it always took place without their cities, particularly among the Jews and Greeks, from whom the Romans derived the custom. We have several passages in the New Testament showing that the Jews buried their dead without the city. Servius, in giving an account of the unhappy death of his colleague, Marcellus, which happened in Greece, says that he could not, by any means, obtain leave of the Athenians to allow him a burial-place within the city.

The Romans observed the same custom from the first building of their city; it afterwards became a law, as settled by the Decemviri, "Neither burn, or bury within the city." They generally buried near the highways—in fields appropriated for the purpose. Their reasons seem to have been founded on sacred as well as civil considerations; among the former, that the passers-by might see the graves and be reminded of their own mortality—hence, as Varro tells us, the inscription upon the monuments, "Sta. Viator;" among the latter, "that the air might not be corrupted by the stench of putrefying bodies." The ancient Persians never buried in cities or towns. Their kings were interred on a high hill, on the east of Persipolis; generally, throughout Persia and the Levant, there were no burial-places except those without the city. The cemeteries of the Turks were always without the town, that the air might not be corrupted by the vapors arising from the graves; they, in like manner as the Romans, also bury by the sides of the highways, that travelers may be reminded to pray to God for the deceased. Eusebius informs us that when the Christians, by favor of Constantine, built churches in the cities, they had their burial-places outside. According to Gregory of Tours, it was not until the latter part of the sixth century (about A. D. 590) that funeral places and cemeteries within the towns were consecrated or tolerated. Hesperian informs us that the ancients greatly disapproved the innovation of burying in towns and churches; and, on that account, the councils of their bishops made several canons and decrees against intramural and church burial.

Whether the ancients burned or interred their dead, they never made choice of the place of divine worship, either to bury the dead or deposit the ashes. For centuries after Christianity was established, they never presumed to make God's temple the charnel of the dead.

On the contrary, when the ancient mode of burial without the city began to be neglected, burials in the churches were approved by authority.

The being buried in or near a church, we are told, originated with the first Christian Emperor, Constantine, who, although he did not desire to be buried within the church (a thing in his day unheard of), was resolved that his remains should be deposited as near as possible to it; they were accordingly interred in the porch of the great church at Constantinople. Subsequently the practice increased and persons of quality claimed a similar privilege. Their inferiors, although they claimed not the right of being buried within the porches, deemed it an honor to be buried as near thereto as possible; hence another reason assigned for large courts and yards around churches.

Intramural burials and church-yards, it would seem, originated in the idea that persons passing the graves of their dead relatives or friends, on their way to worship, might be reminded to offer up prayers for them.

> "The melancholy ghosts of dead renown,
> With penitential aspect as they passed,
> All point at earth and smile at human pride."

With reference to burying in churches, the custom did not arise earlier than the year 1076. In the reign of William the Conqueror, the Council held at Winchester, under Laufranc, Archbishop of Canterbury, by the ninth canon, opposed burial in churches. It soon after, however, became a custom, and vaults were built under the altars.*

"It is horrid," said the Austrian Emperor, "that a place of worship, a temple of the Supreme Being, should be converted into a pest-house for living creatures."

The following extract is from a sermon preached by Bishop Lattimer, in 1552, which proves that even at that early period, when the population of London could scarcely have been one-sixth of what it is now, the nuisance of intramural interments was found to be dangerous to health, if near a church or the houses of the living. "The citizens of Nain," observed the Bishop, "hadd their buryinge-place withoute the citie, which no doubt is a laudable thinge, and I doe marvel that London being soe great a citie, hath not a burial-place without; for no doubt it is an unwholesome thinge to bury within the citie, especialle at such a time when there be great sicknesses and manie

die together. I think, verilie, that many taketh his death in St. Paul's church-yard, and this I speak of experience, for I myself, when I have been there some mornings to heare the sermons, have felt such an ill-favored and unwholesome savour, that I was the worse for it a while after, and I think no lesse but it is the occasion of great sicknesses and disease."

Well would it have been for the inhabitants of this vast metropolis, had Sir Christopher Wren's plan been carried out at the rebuilding of the city after the fire of 1666. All grave-yards, according to his recommendation, were to have been removed without the town.

In the year 1786, the Legislature of Germany passed a law, which was punctually obeyed in the empire over which Joseph II. ruled, and which we would do well to imitate, instead of using the ground around and about our churches and chapels as store and pest-houses. This law prohibited the burying of dead bodies in or around any church or chapel whatever. Neither rank nor affluence could obtain permission to evade it, as in the enforcement of it no respect was paid to persons.

Dr. Adam Clarke, in his commentary on St. Luke, advises that "no burying-places should be tolerated within cities or towns; much less in or about churches or chapels. This custom is excessively injurious to the inhabitants, and especially to those who frequent public worship in such chapels and churches. God, decency and health, forbid this shocking abomination. * * * From long observation I can attest that churches and chapels situated in grave-yards, and those especially within whose walls the dead are interred, are perfectly unwholesome; and many by attending such places are shortening their passage to the house appointed for all living. What increases the iniquity of this abominable and deadly work, is that the burying-grounds attached to many churches and chapels are made a source of private gain. The whole of this preposterous conduct is as indecorous and unhealthy as it is profane. Every man should know that the gas that is disengaged from putrid flesh, and particularly from a human body, is not only unfriendly to, but destructive of, animal life. Superstition first introduced a practice which self-interest and covetousness continue to maintain."

As examples of evils arising from this custom, I quote the following cases:

The Rev. Dr. Reuder, in his tour through Germany, published in London in the year 1810, mentions the case of a very corpulent lady who died. Before her death she begged, as a particular favor, to be

buried in the parochial church. She died on Wednesday, and on the following Saturday was buried according to her desire. The day following the clergyman preached her funeral sermon. The succeeding Sunday, being the day for administering the holy sacrament, about 900 persons were present. The weather was very hot. Many during the service were obliged to go out for a time to avoid fainting, while some actually fainted away. A quarter of an hour after the ceremony, before they had quitted the church, more than sixty of them were taken ill. Several died in the most severe agonies; others of a more vigorous constitution survived by the help of medical assistance. A most violent consternation prevailed about the whole congregation and town. It was concluded that the wine had been poisoned, and so it was generally believed. The sacristan and several others belonging to the vestry were arrested and cast into prison. The persons accused underwent very great hardships. During the space of a week they were confined in a dungeon, and some of them put to the torture, but they persisted in asserting their innocence. On the Sunday following, the magistrate ordered that a chalice of wine, uncovered, should be placed for the space of an hour upon the altar, which time had scarcely elapsed when they beheld the wine filled with myriads of insects, and, by tracing them to their source, it was at length perceived by the rays of the sun that they issued from the grave of the lady who had been buried the preceding fortnight. The people not belonging to the vestry were dismissed, and four men employed to open the grave and the coffin. In doing this, two of them dropped down and expired upon the spot, and the other two were only saved by the utmost exertion of medical talent. It is beyond the power of words to express the horrid sight of the corpse when the coffin was opened. The whole was a mass of entire putrefaction, and it was clearly demonstrated that the numerous insects, both large and small, together with the effluvia which had issued from the body, had caused the pestilential infection which was for a while attributed to poison.

In the autumn of 1843, in Minchinhampton, England, a grave-yard was disturbed which had existed five hundred years. In rebuilding the church it was deemed expedient to lower the surface of the grave-yard to within a foot or two of those buried. The earth so removed, of a dark color, saturated, in fact, with the product of human putrefaction, was in a fatal hour devoted to the purposes of agriculture. About one thousand cart-loads were removed to a new piece of burying-ground to make the grass grow quickly, some as manure in

the neighboring fields, some on the rector's garden, and some in that of the patron. The seeds of disease were thus widely disseminated, and the result was such as any person of common sense might have expected. The diffusion of a morbid poison which soon followed was evinced by an outbreak in this once healthy locality. The family of the rector and the inhabitants of the streets adjoining the church-yard were the first attacked and were also the greatest sufferers. The rector lost his wife, a daughter and his gardener. The patron's gardener, who had been employed in the unseemly art of dressing flower-beds with human manure, also died. The children who attended the school took the fever as they passed the upturned surface of the grave-yard, went home and died, but did not communicate the disease to those who came near them. Seventeen deaths occurred, and upwards of two hundred children had measles, scarlet fever and various kindred eruptions.

In further illustration of this subject, we may cite the instance of the French physicians who were deputed expressly to Egypt by the French government, to investigate the nature of the plague. It is their opinion that the superficial mode of interment that prevails there materially contributes to it. At almost every village they found near the habitations of the Arabs mounds crumbling away and exhibiting the naked bones of those who had been buried in them. In the whole of Lower Egypt corpses are merely thrown on the surface of the earth. A hillock is raised over them, which is quickly demolished, or cracks in drying, while infectious vapors escape through the fissures or flies are admitted to the bodies. The sting of these insects will subsequently produce pestilential tumors of which many of the natives have been known to die.

Carcasses scattered over the field of battle have in all times caused mortal sickness.

We cannot afford space to relate all the accidents that occurred at the beginning of the French revolution. When, on account of the insalubrity of the church and neighborhood of the Cemetery of the Innocents, the government determined to have the remains of the bodies removed, M. Thouret, himself, who was director of the operations, narrowly escaped death from a putrid fever which he contracted in the performance of his duties. The bodies in the burial-ground of St. Eustace, in Paris, were moved in 1780, and of a number of children who were proceeding to the church to be questioned in their catechism, some fell down in a state of syncope, whilst other were subjected to other indis-

positions. Three workmen who had entered the vault died. These and numberless other instances that might be quoted, induced the French government to prohibit interments in or near the town; and it was once in contemplation to burn the dead bodies, according to the custom of ancient Rome.

Vicq. Dazyr says, in regard to these facts: "Were we to collect together all the observations of those who have gone before us, we should find proofs without number of what we advance; the small number of the learned and of persons capable of transmitting to posterity accounts of the deadly effects of interments in churches and in towns, or rather the sanctity with which we ourselves have been used to consider the custom of interring in temples, has been often the reason of attributing to other causes the epidemic diseases which have from time to time depopulated our cities."

Dodsley's Annual Register, July, 1773, gives the particulars of an accident which occurred in a church: "Of one hundred and twenty young persons, of both sexes, who were assembled to receive their first communion, all but six fell dangerously ill, together with the Curé, the grave-diggers and sixty-six other persons. The illness with which they were seized is described as a putrid fever, accompanied with hemorrhagic eruption and inflammation."

All the civilized nations of antiquity have condemned the custom of interment in cities or towns. Wherever he travels, the antiquarian finds in the environs of the great ancient cities *tumuli*, funereal temples, vaults, excavations in caverns, masses of masonry of the most astounding magnitude, such as the pyramids, wonders of the Old World, that appear to have survived the wreck of ages, to teach us an important lesson—a lesson, however, as yet unattended to in many parts of this country.

The examples of the evils arising from intramural interment have thus far been drawn largely from England and the Continent of Europe. The vaults of their churches and crowded church-yards warn us of the danger of this system of burial, that has been handed down to the present century, from the dark period of the middle ages. But it is not necessary to go back to antiquity, or search the pages of ancient history, to establish the fact that the dead and living should not be brought in close proximity, and that, wherever they are, it is always a cause of disease and death. We have had numerous instances in modern times, and in our own country, sufficient to warn us of the

great danger, and of the urgent necessity of making prompt provision to meet them.

The first settlers of the New World came with the traditions of their forefathers. They buried their dead in their midst, and their descendants do so still in very many places. When the population was scattered, and vast territory surrounded the then towns and villages, there was but a minimum of danger; from this fact the people have no doubt become blind to the evils they were fostering in a rapidly-growing country, with large and populous cities and towns building in every direction. Cemeteries extramural have been growing in popular favor in our own country for the last half century. This is an encouraging feature of the times, and illustrates a growing sanitary influence in sharp contrast with the old, offensive, health-polluting grave-yard system. We will cite a few examples of the evils of the old system. Dr. Ackerly thus describes the old grave-yard connected with Trinity Church, New York City, 1822: "During the revolutionary war this ground emitted pestilential vapors, the recollection of which is not obliterated from the memory of a number of living witnesses. In the hard winter of 1780–81 this city was in the possession of the enemy, and the ground was so frozen that the soldiers and others, who were buried there during that long and severe winter, were interred but a small distance beneath the surface. The consequence was, that in the ensuing warm season it became so offensive as to require the interposition of the military commandant, and the Hessian soldiers were employed in covering the ground with a fresh stratum of earth three or four feet thick." In 1814 a battalion of militia was stationed on a lot on Broadway, the rear of which was bounded on Potter's Field (now Washington Square), from which arose a most deadly effluvium. A number of the soldiers were attacked with diarrhœa and fever. They were removed at once. One of the sick died, the others rapidly recovered.

An article in the *Commercial Advertiser*, September 7th, 1822, furnishes further facts: "It will be remembered that the grave-yard being above the streets on the west, and encompassed by a massive stone wall, and the east side being on a level with Broadway, it results that this body of earth, the surface of which has no declivity to carry off the rain, thus becomes a great reservoir of contaminating fluids suspended above the adjacent streets. In proof of this, it is stated that in a house in Thames street springs of water pouring in from that ground occasioned the removal of the tenants, on account of their

exceeding fœtidness. The cellars of all the houses in the streets west of the church-yard were all more or less accessible to impure springs of water." These springs had their source in the grave-yard, which was twenty-five or more feet higher than the last street below it.

There were other grave-yards and vaults in proximity to that of Trinity: the South Reformed Church, having a space of 25,000 square feet in Garden street, which was narrow and confined, and Wall Street Church, covering, with the building, 20,000 square feet, nearly the whole of which was excavated for vaults, and an additional range constructed under the sidewalk. Between Pine and Cedar streets were the burying-grounds of the Associate Reformed and French Protestant Churches. The Middle Dutch Church Cemetery was a considerable place of interment and appropriated to vaults, as also St. Paul's Church and the North Dutch Church in Fulton street. St. Paul's was contiguous to Broadway. The monuments now standing in it bear testimony to its being the resting-place of large numbers of dead. Nearly opposite to it was the grave-yard of the Old Brick Church, which in 1823 was entirely filled. Dr. Pascalis, in commenting upon these, and other burial-places which he makes "of less account," says: "There is, as all know, at the slightest computation, ten acres, or 500,000 square feet of ground, in the church-yards appropriated to graves or vaults. * * * We will take the subject in another point of view, to ascertain whether the space thus employed may endanger the health of the inhabitants. On the authority of observation and experience, it takes more than ten years for the entire decay of the human frame in graves, and a much longer time than that in vaults. * * * The yearly bills of mortality at the City Inspector's office, for the last eleven years, amount to 33,945. We have, then, a total of 33,945 dead bodies dispersed and accumulated within an area of three miles during eleven years and a half, all still under the decomposing operation of nature, and diffusing in the warm season their volatile exhalations in the air we must respire." Dr. Barrow says of them: "They (the grave-yards) are saturated with materials hostile to human life."

In a work published prior to 1823, is the following warning: "Avoid as much as possible being near church-yards. The putrid emanations arising from church-yards are very dangerous, and parish churches, in which many corpses are interred, become impregnated with air so corrupted, especially in the spring, when the ground begins to grow warmer, that it is prudent to avoid this evil, as it may

be, and in some cases has been, one of the chief sources of putrid fevers which are so prevalent at that season." Another writer says: "In the summer of one of the years I have mentioned, the trustees of the church made some repairs to it, and built a porch to each of the eastern doors next to Liberty street. In digging for the foundation of the southeast porch, next to the sugar-house, they came upon the great grave in which had been buried those who died in this sugar-house while it was occupied as a prison during a period of the revolution. The grave was deep and spacious, and it became necessary, in order to get at the solid earth for the foundation of the porch, to disinter a great quantity of the remains of those who had been buried there. Several cart-loads were taken up and carted away. During this operation the air of the church-yard and its vicinity swarmed with myriads of little black flies, very troublesome. They filled our house, covering the sideboard, furniture, and every article on which they could alight. Even closing the doors did not entirely relieve us from the annoyance."

In depositing a corpse in one of the vaults of the Brick Church, Beekman street, the sexton cautioned the attendants "to stand on one side; you are not accustomed to such smells." Mr. De Groadt, the sexton of the Dutch Church above noted, frequently remarked that, in descending into the vaults, "candles lose their lustre; and that the air is so sour and pungent that it stung his nose." The journal says: "This being the case with all the vaults where dead bodies are deposited and subject to be opened at all seasons, this method of disposing of the remains of our friends is, at the least, an unpleasant, and certainly a dangerous one."

The Board of Health in the city of New York, in 1806, appointed a committee to report on measures necessary to secure the public health. The following extract from the report, which was drawn by Dr. Edward Miller, says: "Interment of dead bodies within the city ought to be prohibited. A vast mass of decaying animal matter, produced by the superstition of interring dead bodies near the churches, and which has been accumulating for a long time, is now deposited in many of the most populous parts of the city. It is impossible that such a quantity of animal remains, even if placed at the greatest depth of interment commonly practiced, should continue to be inoffensive and safe. It is difficult, if not impracticable, to determine to what distance around the matter extricated during the progress of putrefaction may spread; and by pervading the ground and tainting the waters,

and, perhaps, emitting noxious exhalations into the atmosphere, do great mischief. But if it should be decided still to persist in the practice of interments in the city, it ought to be judged necessary to order the envelopment of the bodies in some species of calcareous earth, either quicklime or chalk. * * * This growing evil must be corrected at some period, for it is increasing and extending, by daily aggregation, to a mass already very large, and the sooner it is arrested the less violence will be done to the feelings and habits of our fellow-citizens." This report being sent to the Legislature with a memorial upon the subject, resulted in the passage of a law authorizing the corporation of the city of New York to prohibit interments within its limits. The law was afterwards incorporated into the general statutes of the State. It was not till 1823 that the common council of New York passed a prohibitory ordinance upon the subject, and, when passed, it was some years before it became operative.

Dr. Elisha Harris says: "Trinity church-yard has been the center of a very fatal prevalence of cholera, whenever the disease has occurred as an endemic near or within a quarter of a mile of it. Trinity Place, west of it; Rector street, on its border; the streets west of Rector, and the occupants of the neighboring offices and commercial houses, have suffered severely at each visitation of the pest, from 1832 to 1854." Dr. John W. Rauch, in an excellent monograph on interments in populous cities, and their influence upon health and epidemics, says: "During the prevalence of the cholera at Burlington, Iowa, in July, 1850, a number of dead were interred in the city cemetery. No deaths occurred in its neighborhood until about twenty had been buried there. After this, until the epidemic ceased, cases occurred, and always in the direction from the cemetery in which the wind blew." Dr. Bryant, "On Yellow Fever at Norfolk and Portsmouth," in 1856, after giving a history of the epidemic and its terribly fatal results, and offering some suggestions upon a future correct hygiene, says: "The last, and at the same time one of the most important of these suggestions, relates to the remains of the dead. They can scarcely be said to rest beneath the sod. * * * When the summer's sun shall pour its rays down upon this decaying mass, can it be otherwise than that their noxious gases will commingle with the purer air, and sooner or later aid in reproducing other harvests of disease and death? * * * The remedy here indicated is the disinterment of the dead, and their removal to a distance of not less than eight miles from either city. It is the total forbidding of intramural or even near-

by suburban cemeteries." Dr. Buck, in his work on hygiene, says: "It is impossible to say how long the *materies morbi* may continue to live under ground. If organic matter can be boiled and frozen without losing vitality, and seeds 3,000 years old will sprout when planted, it would be hardihood to assert that the poison of cholera, yellow fever or small-pox, whatever it is, may not for years lie dormant, but not dead, in the moisture and temperature of the grave."

But we will now cite some cases in our own State which reveal a condition of things horrible almost beyond belief. The Weehawken Cemetery, in Hudson county, has required legal proceedings on the part of the authorities there. A communication is on file at the office of the State Board of Health, accompanied by affidavits, which gives a series of facts such as show it even now to be a great public peril. From the statements, we learn that the grave-yard is owned by a private corporation. It has been used for interments for sixteen or seventeen years. The cemetery contains but seven acres, and from ten to twelve thousand bodies have been crowded into its narrow limits, and, from the evidence adduced, the land is totally unfit for burial purposes. Jacob Haushe, who resides on the north side of the cemetery, testified to a most revolting state of things. He says, that a very bad smell pervades the whole neighborhood, the fœtid odors arising from the corpses of the dead. Haushe describes the smell as that of "rotten carrion," extremely offensive. We visited the cemetery, and the smell was even worse. The ground was cracked open and the cracks emitted a stench that poisoned the atmosphere. The cracks were afterwards closed up, but subsequently the carrion oozed out from the ground, smelling most offensively. The receiving vault in the grave-yard also emitted very noisome odors. Visitors at Haushe's house have complained of the smell, not only while passing the cemetery, but while sitting in the house. This condition of things, the witness testified, has continued for a long time. Other witnesses testified that the odors arising from the graves are "like those of decayed human flesh—a peculiar smell, and very offensive." Many of the families resident in the vicinity of the cemetery testified that much sickness in their families was produced thereby. It seems impossible that such things can exist in a civilized community, but they are well attested by reputable people, long-time residents of the neighborhood.

From the apathy evinced in many parts of this country in the disposal of the dead, it would seem that nothing short of one of those

terrible epidemic inflictions which the Almighty has allowed to be the penalty of the breach of His laws, will bring the people to a sense of the evils and perils of such abominations. There can be no doubt that, under any circumstances, in densely populated neighborhoods where cemeteries have been in use for a long time, the practice of burying within the precincts of towns is, unless guarded by the strictest regulations, most productive of injury to the health of the inhabitants.

The following statement explains itself:

"DR. WARMAN—In compliance with your request, I make the following report concerning the Mercer Cemetery, Trenton, New Jersey: On a Monday, September, 1861, eleven men were set to work to prepare the ground for the building of the present passenger depot of the Pennsylvania Railroad, and also the road-bed for the necessary tracks. The ground was a swamp, covered over with a dense growth of willows, alders, magnolias, &c., situated in the valley of the Assanpink creek. On the following Monday morning, seven of the men were dead, and the other four confined to their beds, dangerously ill. These subsequently recovered their health, but each was attacked with a skin disease of the face that has hitherto resisted all treatment. One of the men is dead; the other three are still living.

"*Geological Formations*—The substratum of the plateau upon which the cemetery, depot, and railroad tracks are located, is gneiss; dip of strata, forty feet; trend, northeast and southwest. This is covered with gravel and coarse sand for twenty or thirty feet, and then a superstratum of four or five feet of loam.

"The stream has cut a valley some twenty-five feet deep, at right-angles with the trend of the gneiss. The cemetery is located upon the west side of the creek, on the top of the plateau, some twenty-five feet above the swamp, and here the ground-water from the plateau finds its outfall into the above-named swamp. After the ground was cleared of bushes and the filling-in of the quagmire was commenced, the stench from the disturbed mud was almost unendurable, and the men could only work during a few hours in the middle of the day.

"Owing to the existence of the war at that time, labor was very uncertain, and, hence, the history of the men cannot be traced. But this much is certain, that many persons were employed and left on account of sickness, and that a virulent fever attacked many of the persons who lived near by. The physicians called the disease typhoid fever. Whatever its proper name it was very fatal, and the more so the nearer the swamp and cemetery.

"The cemetery is located about two hundred and fifty feet from the valley west, and was first used in 1842. The soil in which the bodies are buried is coarse sand and gravel, hence most favorable for rapid decomposition. A low state of vitality has characterized the employes of the railroad serving about the depot, and many have had to leave on account of broken health."

The above communication was handed me by Dr. J. I. B. Ribble, of the city of Trenton, whose attention was called to the above-stated facts from having treated two of the sufferers for the peculiar skin affections alluded to. There can be no question but that the emanations from the decomposing bodies and the digging up of the saturated soil was the cause of the virulent fevers that prevailed at the time in the neighborhood.

This brings us now to the consideration of the methods of disposal of bodies as buried, most favorable to natural decay. There are two modes of interment practiced in this State—one in graves and the other in tombs. We much prefer the former. As has been noticed, dangerous gases often escape from tombs when insecurely closed, or when often opened for new deposits. Besides these evils there is no security that deposits in tombs will ever return undisturbed to the earth. They are there exposed to removal and desecration, which sometimes takes place (as in the case of A. T. Stewart).

Very properly, we think, tombs are not allowed in many parts of our country. Graves alone are used. Mount Auburn Cemetery, near Boston, is a notable example of this. "Earth to earth," seems to be the generally adopted plan of burial at the present time, among all civilized nations. Much has been said lately of a return to the practice of interring the dead without the medium of a coffin. Why should we not go to our graves in our habits as we lived? as in the case of the soldier described by Wolfe:

"No useless coffin enclosed his breast,
Nor in sheet nor in shroud we wound him;
But he lay like a soldier taking his rest,
With his martial cloak around him."

It is not at all unlikely that this method will be chosen by many as a settlement of the sanitary questions that have sprung into notice since cremation has been once more broached.

In the Norman dynasty it was the custom to bury in the bare ground. Also in the time of Edward II. and Edward III., even persons of distinction preferred to have their bodies committed to the bare earth. It was the common custom in the time of Queen Elizabeth to bury only in winding sheets. Interment in the bare earth was the common method among the Jews and other nations as well. It is supposed that the dead bodies of the pilgrims at Plymouth, so many of whom died during the first winter, were thus laid. In Dr.

Samuel A. Green's *Early Records*, are the items of a town clerk's funeral expenses. They are: "A winding sheet, 18*s.*; coffin, 10*s.*; grave digging, 7*s.* 6*d.*"

Mr. Seymour Hayden, of London, would abolish coffins altogether, and substitute wicker-work filled with flowers. The proposal is new and has been recommended with great force, and we have no doubt but that, if introduced here, would meet with popular favor. The question is, will the abolition of coffins improve matters? We fear the result might be something like the following extract: "In the course of walking round the city we had occasion to pass through one of the cemeteries, but the horrible effluvia from the graves obliged us to alter our course. The Turks do not make use of coffins. Having dressed the dead, they place over the body a few thin pieces of wood, and then cover it with earth. Heavy rain has often the effect of opening passages down to the putrefying mass, occasioning that pernicious and terrible smell which we experienced, and to which in some degree might be attributed the frequency of pestilential diseases in Turkey." The interment of a body in a mere shroud is no new idea. There can be no doubt that in ancient times the practice was almost universal among those who buried their dead. It is hoped that by dispensing with the coffin the body will sooner return to the elements, about which there can be no question; provided, that the earth in which it is interred be a suitable one. But that is not always the case, for under certain circumstances of humidity in the soil, the muscular fibres of the body, for instance, are converted into adipocere. Soils which keep out the atmospheric air are nearly always favorable to the generation of this substance.

This kind of earth, it need hardly be stated, is unsuitable for sepultural purposes. The ground chosen may not only be too damp and clayey, and impervious to air and moisture, but it may be of too open a character. Were we to bury in light, gravelly soil of this class without coffins, it is not unlikely that the foul gases would rise faster than they ought. We do not know why coffins were originally resorted to; but it is just possible that our forefathers discovered that, in certain soils, the earlier and fouler stages of decomposition proceeded at too rapid a pace for the comfort of the living. The depurative character of the soil was not equal to the demand made upon it. This is not an altogether theoretical statement, for an eminent foreigner has noticed that this is the case in grave-yards which he had visited. A coffin may therefore be a desirable thing under some circumstances.

It is a fit question to consider, also, whether it would be safe to carry a person who perished (for instance) with small-pox, without protection by means of a coffin. Mischief would be less likely to result, after such a lapse of time as was found necessary to destroy the coffin. Here is where the advantages of cremation appear, for with the body is burned up all disease germs. The thing to consider is, How many persons die with contagious diseases, the germs of which not even the earth can destroy? It is not so much a question of coffin or no coffin. When the Minchinhampton church-yard was disturbed, and the black earth carted away to the gardens round about, the population was simply decimated, and the same would have occurred, one would imagine, even if the coffin-earth had been absent.

The sanitary requirements for a cemetery indicated under the foregoing remarks, may, therefore, be summed up under the four following headings:

1. Suitable soil.
2. A suitable position with respect to population and sources of water supply.
3. Sufficient space.
4. Proper regulations and management.

Very much depends upon the soil of a cemetery. Dr. Parsons, in the eleventh annual report to the Local Government Board of England, says: "The soil should be of an open, porous nature, with numerous close interstices, through which air and moisture may pass in a finely divided state, freely in every direction. In such a soil decay proceeds rapidly, and the products of decomposition are absorbed or oxidized. The soil should be easily worked, yet not so loose as to render the work of excavation dangerous, through the liability to falls of earth. It should be free from water, or hard rock, to a depth of at least eight feet. If not naturally free from water, it should be drained, if practicable, to that depth; to this end it is necessary that the site should be sufficiently elevated above the drainage level of the locality, either naturally or where necessary by filling it up to the required level with suitable earth. Loam or sand, with a sufficient quantity of vegetable mould, are the best soils; clay and loose stones the worst. A dense clay is laborious to work and difficult to drain; by excluding moisture and air it retards decay, and it retains in a concentrated state the products of decomposition, sometimes to be discharged into graves opened into the vicinity, or sometimes to escape through cracks in the ground to the surface. A loose,

stony soil, on the other hand, allows the passage of effluvia." And with reference to the site to be chosen for a cemetery, he further says: "Nevertheless, in view of the evils which in former times have undoubtedly arisen from the practice of intramural sepulture, and also because the erection of houses near a cemetery interferes with the free play of air around and over it: the place of burial should, therefore, be selected in a somewhat secluded and not in the most conspicuous part of the town, and should also be combined with such natural scenery as will tend to inspire those feelings of solemnity and decorum which properly belong to the 'city of the dead.' It should not be where it would ever be liable to be encroached upon for buildings, roads or any other purpose, but where the tenants may remain forever undisturbed in their quiet resting-place; and it should be large enough to meet the wants of the probable future growth of the town which it is designed to accommodate. Parts of such a cemetery might be assigned to a peculiar religious denomination, and, if desired, specially consecrated for its use. It should never be within a populous city or town." Such a site is now generally regarded as dangerous to the health of the living, though in this country we have not as yet experienced to a great extent the evils that have existed in London and other large cities in England. "It is highly desirable that interments should not be made up to the extreme edge of the cemetery, and it would be possible, without great waste of space, to reserve in all cases a strip of ground, free from interments, fifteen to thirty feet in width, around the whole cemetery in the interior of the boundary fence. This strip should afford room on the inside for a gravel or asphalt walk, to give access to all parts of the cemetery, and on the outside, next the fence, to a belt of shrubs or trees, the rootlets of which, penetrating the soil, would arrest and assimilate any decomposing matters percolating to the exterior of the cemetery. Obviously a cemetery should not be placed on elevated ground above houses, where the soakings from it may percolate to the sites and foundations of the dwellings below." Sites are, of course, unsuitable which are liable to be flooded or to land-slips, or which are in danger of being washed away or encroached upon by streams or the sea. Very steep sites are not desirable. The cemetery should be accessible by good roads from all parts of the district. The selection of a proper site for a cemetery, on sanitary and other grounds, is one of the greatest importance, and any one who has this duty to perform cannot do better than keep the following words of the well-known English sanitary engineer, Mr. Eas-

site, before him. He says: "A well-chosen cemetery is one whose soil is dry, close and yet porous, permitting the rain and its accompanying air to reach a reasonable depth and so expedite decay. The formation is also well covered with vegetable mould, which assists in neutralizing any hurtful emanations and encourages the growth of shrubs. The subsoil is also of such a character as to need no under-draining and such as will prevent the water from lodging in any grave or vault. It will also stand exposed to the north or northeast winds, which are dry and do not hold the putrefactive gases in solution like the moist south or southwest winds. An improperly chosen grave-yard may be said to be one where the soil is dense and clayey and impervious to moisture. It will be insufficiently drained, necessitating the use of planks to walk upon in wet weather. It will be too close to the abodes of the living; too small to permit a proper planting; the graves may be covered with flat stones, which prevents the passage downwards of the air and rain; and surrounded, moreover, by high walls which exclude the fresh air. The grounds will be stony and insufficiently covered with vegetable soil. No natural outfall will exist, and the drainage water must be pumped up, the bare idea of which is horrible. It will be near, also, to a water-bearing strata or to a reservoir. Long before decomposition has taken place, owing to the smallness of the site, and the impossibility of obtaining more land, except at high building prices, the organic matter hidden out of sight will be far too large in proportion to the area."

The dangers to the public health to which places of burial may give rise, are of two kinds, viz.: the contamination, first, of air, by volatile particles or gases; and, second, of drinking-water, by suspended or soluble products of decomposition. Foul liquids from graves may enter and pollute a stream; or wells in the vicinity of a grave-yard may be injured by percolation from it; and, in either case, if the water be used for drinking, injury to health may result. The liability of wells to pollution obviously depends, partly upon their proximity to it, and partly upon the configuration and geological structure of the ground. Thus, an intervening and impervious bed of clay will prevent foul matters reaching a well; and filtration through a sufficient space of porous, aerated soil decomposes such matters into harmless, inorganic substances, which are fixed by the soil or taken up by plants. It is necessary, therefore, in order to obviate risk from this cause, that a cemetery should have a suitable soil and

be properly drained, and that it should be at a sufficient distance from subterraneous sources of water-supply; and in such a position with respect to them, that the percolation of foul matters from one to the other may be impossible.

The Massachusetts State Board of Health (report of 1875) notices the following examples of water-pollution which had been recently reported: "At a meeting at Milan, Dr. Polli, to prove that inhumation taints air and water, referred to certain researches of Prof. Selmi, of Mantua, and to chemical analyses of the waters of Milan, by Professors Parvesi and Rontondii. M. Ducamp discovered, in Paris, a well, the water of which was entirely derived from cemeteries. It had acquired a sulphur-like taste, so that the people bought it for mineral water." The following case is also furnished: "In the last remarkable report of the Faculty of Medicine of Saxe, Reinhard relates that nine large and several smaller victims of the cattle plague were interred at Dresden, at a depth of ten or twelve feet. It was found, the next year, that the water from a well situate one hundred feet from the pit in which they were buried, had a fœtid odor, and contained butyrate of lime. At a distance of twenty feet it had the disgusting taste of butyric acid; and each quart contained about thirty grains of this substance." The water from grave-yards contains ammonium and calcium nitrates, and nitrites, and sometimes fatty acids and much organic matter. Lefort found a well of water, at St. Didier, more than three hundred feet from a cemetery, to be highly contaminated with ammoniacal salts, and an organic matter left on evaporation. The water was clear at first, but had a vapid taste.

A recent report on the preservation of the anthrax germ in graves, furnishes the following fact: "In Livingston county, New York, on a sandy soil over a heavy clay soil, the graves were carefully fenced in by direction; but nearly a year after, during a rainy period, the liquid, oozing out on the river-bank between the clay and sand and opposite one of the fenced graves, was licked by six of the cattle, all of which promptly perished of anthrax. The grave was now fenced in down to the water, and no further deaths occurred."

In the selection of a cemetery site, the pollution of wells and of water-supply should receive especial attention. Thus, it is stated in a collection of reports concerning the cemeteries of the town of Versailles, that the water of the wells which lie below the church-yard of St. Louis could not be used on account of its stench. In consequence of various investigations, in France, a law was passed prohibiting the

opening of wells within 100 metres of any place of burial; but this distance is now said to be insufficient for deep wells, which have been found, on examination, to be polluted at a distance of from 150 to 200 metres. In some parts of Germany the opening of wells nearer than 300 feet has been prohibited.

In the report of the Board of Health of New Jersey, 1880, we find the following from a writer in the northern part of the State: "Another great nuisance in some parts of the county is the grave-yard: such a one as we have in the village of ——, in the shape of a burying-ground. It is in the center of the village, and on the elevated side of the street. The church is in the grave-yard. Private dwellings are situated on the lower or other side of the street. Each house has a well of water for family use. The water runs from the grave-yard into these wells. The old sexton of this church told me a number of times, that when graves were dug in certain parts of the yard, the wells would become soiled and muddled during the process of digging. The children of the Sunday school drink out of these wells; and the children of the public school in the place patronize them, as the school has no well of its own, and, if it had, the school house is situated at the lower end of the grave-yard. This grave-yard is a confirmed nuisance. It is an old yard, and the community still bury in it. The land is wet and soggy in the yard. There are a number of good locations, within a half mile of the village, for a cemetery; soil dry and pleasant. I urge strongly on the State Board of Health, that an act of the Legislature be passed preventing any more burials taking place in this grave-yard."

Another writer, from another county in New Jersey, remarks that burial-grounds are mostly connected with churches, and raises the question whether churches which are closely crowded upon by graves, and not occupied during the week, do not become receptacles of grave-yard air and thus risk the health of the Sabbath worshipers, especially in those churches heated by furnaces, which cause a current of air from without laden with noxious gases. Again, in the report of the Board for 1882, the same complaint comes from a writer in the southern part of the State. He says: "In the principal village of this township the well water is exceptionally bad, and of offensive smell. As the grave-yard, now well filled with the dead, is near the center of the village, and on a rise of ground, and all the wells, with offensive odor and bad taste, are east of the grave-yard and near by, (my own is about twenty paces,) I have long ceased to use my well for drinking

purposes, believing it to be contaminated with the decomposition of the dead bodies. I have noticed that all the families living east of the grave-yard have more or less sickness, and a great deal more than those living west of it, as the streams all run east to the bay shore. This may account for it. I had one death in my own family, and several others sick with typhoid fever. This happened several years ago. Since then we have stopped using well water, and have been free from any diseases traceable to bad water."

In the report of the British Local Government Board, before noticed, upon the relations of a cemetery to sources of water-supply, we read: "It is evident that the drainage of a cemetery should not be allowed to enter a stream from which water is drawn for domestic purposes. The degree to which the purity of neighboring wells is endangered by a cemetery, and the distance to which contamination may extend, obviously depend in each particular case upon the relative elevation of the respective sites, of cemetery and well, and upon the nature and dip of the intervening strata, so that it would seem impossible to lay down a general rule for all cases. Fissured rock might allow foul matters to traverse considerable distances, while the interposition of a bed of clay, or a water-tight vault, would shut them off, or the passage through an aerated stratum of finely divided earth would oxidize and destroy them on their way. A dangerous state of things is when the graves and wells are sunk together in a shallow, superficial water-bearing stratum of a loosely porous nature, resting on impervious clay."

CONTAMINATION BY AIR.

This may take place in several modes. The gases evolved from putrefying bodies may make their way to the surface through pores or fissures in the ground, or may pass into open graves dug in the neighborhood, or they may diffuse themselves laterally through the ground air, and be drawn up into the interior of houses or churches; or noxious emanations may be given off from putrid drainage water, whether bailed out of graves and thrown upon the surface, or draining into open channels or water-courses. Thus nuisance and danger to health may be occasioned not only to grave-diggers and persons attending funerals, but also to the inhabitants of houses in the neighborhood of the burying-ground. To obviate these risks it is necessary that the number of decomposing bodies in a given portion of ground should not at any time be so great that the gaseous products

cannot be oxidized into harmless substances in the interstices of the soil or taken up by vegetation, that a sufficient depth of earth intervene between corpses and the surface, and that the soil be of a suitable nature and properly drained, the drainage water being harmlessly disposed of. Furthermore, since the atmospheric contamination which has to be especially guarded against, is that of the air in the interior, and neighborhood of human habitations and frequented places such as churches, it is necessary that the place of burial should be in an open situation and at a sufficient distance from dwellings or churches, in order that any effluvia arising from it may be diluted by the winds so as not to find their way in an injurious state of concentration to places where they will be liable to be inhaled.

The geological structure of the earth, the character of the soil, its water-bearing strata, its slope, and its deep and effective drainage have much to do with its adaptability. Then, again, there is a great difference in the capacity of ground to get rid of the products of decay. Cases have been brought to our notice where school houses are located at or very near burial-grounds, or where basements of churches, located in and among graves, are used for school and meeting purposes, in many of which a furnace is located for heating purposes; the hot furnace acting as a great suction pump for the grave-yard air that may be laden with the products of decomposition. A hot furnace in such a place may do serious harm. The writer of this can give testimony in relation to a school house located in one corner of a country grave-yard, in which, during the months of August and September, a number of bodies had been placed that had died from epidemic dysentery. Soon after burial a heavy rain storm followed. The soil was a heavy clay. Large cracks formed in the soil over the graves, and a sickening odor escaped, so much so that the windows on the side adjacent to the grave-yard had to be closed, and the teachers and children were both affected for a time. Mr. Hutchinson, Surgeon, of Farrington street, London, says he was called to attend a girl aged fourteen, who was suffering with typhus fever of a highly malignant character. The girl was the daughter of a pew-opener in one of the large city churches situated in the center of a small burying-ground which had been used for interment for centuries, the ground of which was raised much above its natural level, and was saturated with the remains of the bodies of the dead. There were vaults beneath the church, in which it was still the custom, as it had long been, to bury the dead. The girl in question had recently returned from the country, where

she had been at school. She assisted her mother in shaking and cleansing the matting of the aisles and pews of the church, a few days before being seen by Mr. Hutchinson. The mother stated that this work had usually been done once in six weeks; that the dust and effluvia which arose always had a peculiar fœtid and offensive odor, very unlike the dust which collects in private houses; that it invariably made her (the mother) ill for at least a day afterwards, and that it used to make the grandmother of the present patient so unwell that she was compelled to hire a person to perform the duty. On the afternoon of the same day on which this young girl, now ill, had been engaged in her employment, she was seized with shivering, severe pain in the head, back and limbs, and other symptoms of commencing fever. On the following day all these symptoms were aggravated, and in two days afterwards malignant fever was fully developed.

Among others who obviously suffer from this cause are the families of clergymen, when, as occasionally happens, the parsonage is situated very close to a full church-yard. Dr. Stephen Wickes, of Orange, N. J., in an excellent treatise on sepulture, (Transactions New Jersey Medical Society, 1883,) says: "One clergyman's family I know of, whose dwelling house is so close to an extremely full church-yard, was annoyed by a very disagreeable smell from the graves, always perceptible in some of the sitting and sleeping rooms. The mother of this family states that she has never had a day's health since she has resided there, and that her children are always ailing. Their ill health is attributed both by the family and their medical friends to the emanations of the church-yard."

It is stated by Sir James Macgregor that on one occasion, in Spain, soon after 20,000 men had been put into the ground within the space of two or three months, the troops that remained exposed to the emanations of the soil, and that drank the water from the wells sunk in the neighborhood of the spot, were attacked by malignant fevers and by dysentery, and that the fevers constantly put on the dysenteric character.

The placing of a dead body in a grave, and covering it with a few feet of earth, does not prevent the gases generated by decomposition, together with the putrescent matters which they hold in suspension, from permeating the surrounding soil, and escaping into the air above and the water beneath. "I have examined, says Dr. Lyon Playfair (1881), various church-yards and burial-grounds, for the purpose of ascertaining whether the layer of earth above the bodies is sufficient

to absorb the putrid gases evolved. The slightest inspection shows that they are not thoroughly absorbed by the soil lying over the bodies. I know several church-yards from which most fœtid smells are evolved, and gases with similar odors are emitted from the sides of sewers passing in the vicinity of cemeteries, although they may not be more than thirty feet from them."

The first result of the smell from a grave-yard is generally headache. A military officer said that when his men occupied as a barrack a building which opened over a crowded burial-ground in Liverpool, the smell from the ground was at times exceedingly offensive, and that he and his men suffered from dysentery. A gentleman who had resided near that ground said that he was convinced that his own health and that of his children suffered from it, and that he had removed to avoid further injury.

The following testimony of a lady at Manchester is added as an example of how air may be contaminated *by sewers near grave-yards* and cemeteries: "You resided formerly in the house contiguous to the burying-ground of ——— chapel, did you not? Yes, I did, but was obliged to leave it. Why were you so obliged? When the wind was west the smell was dreadful; there is a main sewer runs through the burying-ground, and the smell of the dead bodies came through this sewer, up our drain, and until we got that trapped it was quite intolerable. Do you think the smell rose from the emanations of the sewer and not from the burying-ground? I am sure they came from the burying-ground; the smell coming from the drain was exactly the same as that which reached us when the wind was west, and blew upon us from the burying-ground; the smell was very peculiar; it exactly resembled the smell which clothes have when they are removed from a dead body; my servants would not remain in the house on account of it. Did you observe any effect upon your health when the smells were bad? Yes; I am liable to headaches; and these were always bad when the smells were so also; they were often accompanied by diarrhœa in this house; before I went there, and since I left, my headaches have been trifling. Were any other of the inmates of the house affected with illness? I had often to send for the surgeon to my servants, who were liable to sore throats. And your children, were they also affected? My youngest child was very delicate, and we thought he could not have survived; since he came here he has been quite strong and healthy."

In the course of an examination of the chairman and surveyor of

the Holborn and Finsbury Division of Sewers, on the general management of sewers in London, the following passage occurs: "You do not believe that the nuisance arises in all cases from the main sewers? Mr. Roe—Not always from the main sewers. Mr. Mills—Connected with this point, I would mention that where the sewers come in contact with the church-yards, the exudation is most offensive; have you noticed that in more than one case? Yes. In those cases have you had any opportunities of tracing in what manner the exudations from the grave-yard passed to the sewer? It must have been through the sides of the sewers. Then, if that be the case, the sewer itself must have given way? No; I apprehend, even if you use concrete, it is impossible but that the adjacent waters would find their way through the cement; it is the natural consequence; the wells of the houses adjacent to the sewers all get dry whenever the sewers are lowered. You are very certain that in the course of time exudations very often do, to a certain extent, pass through the brick-work? Yes; it is impossible to prevent it. Have you ever noticed whether there was putrid matter in all cases where the sewer passed through a burial-ground? The last church-yard I passed by, in the parish of St. Pancreas, when the sewer was constructing, I observed that the exudation from it into the sewer was peculiarly offensive, and was known to arise from the decomposition of bodies. At what distance was the sewer from the church-yard? Thirty feet."

That these emanations do act injuriously on the health of the people resident in the immediate neighborhood of the places from which they issue, appears to us, by the evidence that has been adduced, to be indubitably established.

SUFFICIENCY OF SPACE.

On sanitary grounds, it is requisite that each corpse shall be surrounded and covered by a mass of earth sufficient to deodorize and destroy the putrid emanations proceeding from it, and also that the total amount of space shall be so great that it may not be necessary to re-open any grave until the body previously interred therein shall be completely decomposed. With regard to the amount of land necessary for a cemetery, Dr. Parsons calculates that about a quarter of an acre of land for every thousand of the population of the community to whom the cemetery belongs, is the usually estimated minimum, but this is far too small a proportion even for a cemetery possessing every advantage, and he further states the desirability of

providing more than the bare minimum of space is obvious, and is generally recognized. It must be remembered that, as a rule, quite one-sixth of the total area of a cemetery is taken up by roads, paths and ornamental grass or beds of flowers and shrubs, the chapels, mortuaries, lodges, &c., and sufficient width should be allowed between each grave-space to permit every grave being reached without trampling on others. A standard of 110 burials per acre has sometimes been taken, but this appears to be rather a small one. It has been estimated by others that an acre of ground is capable of affording decent burial to not more than 136 bodies yearly, but in the thirty-seven burial-grounds of Liverpool, taking one with another, the number of burials to an acre is fully double that just stated. Were the calculation confined to the burial-grounds most in use, the proportion would be greatly augmented. Therefore, the whole subject of the locality of the cemetery should be regulated by authority, so that the graves of the multitudes of the dead should not be close to the habitations of the living, so that the air we breathe and the water we drink should not become contaminated with the product of decaying animal matter.

Therefore, since inhumation is the generally adopted method of disposing of the dead at the present time, and in view of all the evils that have been pointed out in the past and that may arise in the future, it is plainly apparent that *no cemetery should be located or managed without due authority from some sanitary board.*

In conclusion, I cannot do better than to quote from the admirable and exhaustive treatise on Sepulture, by Dr. Stephen Wickes, already alluded to. He says: "The country towns in the vicinity of our great cities have become suburban; small villages have become considerable cities. The population, as it increases, crowds upon the old and venerated burying-places, and they are enlarged to meet their increasing interments. The authorities of such towns are stimulated by their growth to add to their attractions by improvements in their drainage, by abating nuisances, and by conveniences of various sorts; but when, as has occurred in some towns, they are warned of the dangers of the grave-yards, and importuned to abate them, they let them alone, to receive their annually increasing dead, to exhale their noxious miasm, to pollute their water-supply, and to become nuisances of a daily increasing power for evil. The most of the governments of Europe have prohibited intramural interments absolutely. In our own country, the disposal of the dead has not been a subject of legis-

lation by State legislators, to whom it properly belongs. The regulation of burials has been left to municipal authority, liable to be governed in its action by local influences. * * * The legislatures of our States adopt laws of quarantine to protect the people from the importation and consequent spread of contagion. The State of New Jersey, perhaps others, provides by a general law against the infection of cattle. Our law-makers do not recognize as they should the fearful dangers of the inhumation of human bodies dead from malignant diseases, with its specific germs—germs which float in the air we breathe and the water we drink; germs which neither boiling or freezing can destroy; germs which, after being buried in the earth for centuries, when brought to the surface by excavations produce a pestilence, and which, like vegetable seed germs buried for ages in the earth, when brought to the surface bring forth fruit after its kind. * * * Inhumation commends itself to the traditional sentiments of the people, and an innovation upon these is not demanded. * * * Rural cemeteries, properly regulated, under wise control, guarded by good laws, and permanently extramural, afford all necessary protection to the public health."

SANITARY INQUIRIES AS TO HEALTH RESORTS AND OTHER LOCALITIES.

The examination of the various health resorts of the State was commenced about the 20th of April and continued at intervals during the year. Our object was to find the present condition, and, also, how far suggestions made in former visits had been carried out. It was gratifying to find that, with rare exceptions, great improvement was manifest, both in the diligence and intelligence of Boards of Health. At Cape May, the sewer system had been extended, and more attention given to the ventilation of the sewers, especially at the points of house connection.

It had been noticed the previous year that one large hotel was greatly needing a reconstruction of its sanitary arrangements. It was unfortunate that this was not reached more promptly, but the building has now been greatly improved in its sanitary condition. If only the management of the hotels and large boarding houses is made as good as that of matters outside of buildings we believe prevalent healthfulness will result. There must be a thorough system of house to house inspection by those competent and fearless, and a report to the Board of Health of any deficiency either in construction or administration.

CAPE MAY POINT.

This locality has recently come into notice as a winter as well as summer resort. An examination showed that it was dependent on driven wells, which differed somewhat in the quality of the water. The drainage is not so good as it should be, but it is hoped that ere this unnecessary pond holes have been drained and filled.

The provisions of the hotels as winter resorts were incomplete, and a thorough reconstruction as to sanitary arrangements in that occupied

for the winter was recommended. The owners have now taken hold of the problem fully and are applying the "Pullman" method to the drainage and sewerage of the entire city.

VINELAND.

This inland resort was found to have made many important improvements during the past year. A system of inspection is carried out, and a Board of Health with intelligent activity and full powers is diligent in its service. In a few cases of dilatory action on the part of occupants of property we had the opportunity of seeing the recognition of health authority, and feel sure that great progress is being made. The people respond to these improvements and thus help to aid in the appreciation of the locality as a place of winter and spring sojourn.

ATLANTIC CITY.

The great sanitary event of the year for this city has been the introduction of a water supply which seems entirely satisfactory, both as to quantity and quality. Already the reward has come in increasing confidence in the city as both a winter and summer resort. The Board of Health has been aroused to new vigor, and is doing a great work in the interests of the city. A Health Inspector has been appointed, who devotes himself to an investigation of the sanitary condition of the city. The removal of garbage is much better managed than formerly. The rules as to privy construction and cleansing are more diligently enforced. Better than all, the city itself, or enterprising citizens thereof, have come to realize that it was in vain to point to natural advantages, to sandy soil, or to former crude methods of slop-water disposal, as adequate to the care of the liquid refuse of so large and crowded a resort.

Hence a contract has been made by which all liquid material will be constantly carried out of the city by means of sewers to a distant point, where it will be mechanically and chemically treated and utilized. The system will be completed before spring, and thus enable all hotels and boarding houses to connect therewith. Visitors hereafter will not be content to sojourn where such provisions are not secured. The authorities will no doubt see to it that these sewers are properly flushed and ventilated. The city seeks the prompt removal of all decomposable materials without its transfer into any

adjacent waters. The spirit and enterprise which have been manifested and the inspection which has been instituted, deserve and will receive recognition.

All these growing cities need to assert and exercise, through their Boards of Health, the right to secure healthy domiciliary conditions. The change of sentiment on some leading sanitary topics was not less encouraging than the actual activity which was manifested.

The city has now contracted for a system of sewers which will entirely remove all liquid refuse at once, and thus by the coming summer complete a sewer delivery and clarification at a distance beyond the suburbs.

POINT PLEASANT.

The development at this point has been so rapid the last year as to make it necessary to inquire carefully into its general situation and constructive arrangements.

Its water-supply is from driven wells of varying value. While many of these are reliable, it is advised that cisterns above ground be used for potable water until a more general supply is secured.

The water level of the soil is near the surface, and there is much need of efficient drainage. In parts, this is being attended to. The construction, as well as the emptying of all closets, should be in charge of a skilled inspector. It is one of those places which must depend upon active and intelligent regulation and administration.

A water company was formed early in 1883, and before another summer a full supply is probable. The proper garbage, water-closet and sewage disposal will depend upon the exercise of proper sanitary police, which is sure to exist if only visitors, in a way that is not captious, see to it that some system is being carried out.

OCEAN BEACH.

This locality shows no improvement in its care of sanitary conditions. The ground water level is high, and no skilled attention is given to drainage. The water-supply is mostly from driven wells, which are generally surface wells. Privy vaults are of the crudest construction. Slop-water is disposed of in cesspools, often in close proximity to wells. This sanitary lawlessness has not been without its deleterious results. The locality is capable of being made one of

the very best along the coast, but until a different system of construction and administration obtains, it is the duty of those who have care of the public health to state the facts. A year since we made personal appeal to those interested, but no skilled system of sanitary construction or supervision has been put in execution so far as we have ascertained.

ASBURY PARK.

This city is an excellent example of what good administration can accomplish. The Board of Health has for two or three years past had efficient organization and intelligent oversight of health interests. The system of sewers is well managed although not fully complete in details. While the liquid portion is carried into the sea, this is so managed as to be, as we believe, devoid of evil of any kind. At the point and at the time chosen, it cannot, as we see, in any way affect the bathing, and secures a thorough riddance of all slop-water. Privy construction and removal are conducted under skilled oversight. The flushing of the sewers is very efficient and they are so ventilated as to secure currents of air through them. If the individual housekeeping of the hotels and other buildings is kept on a par with the sanitary administration of the city, there can be no reason why it should not remain one of the most healthy localities along the coast. There is in most of the city good underground drainage, and the driven wells are down at an average of twenty feet. The care exercised over the ground and its purity goes far to secure purity of water. Yet it is well also to have an eye to larger growth and to such water-supply as is wholly independent of the ground on which a close population is to be crowded. Well-constructed cisterns are not relied upon along the coast to the degree that is warranted. These are especially to be commended to those smaller towns in which there is no general water supply or where the height of subsoil water and the management of slop and privy systems is such as to be of doubtful propriety. Asbury Park has done, and is doing, very much to secure a thorough sanitary administration.

OCEAN GROVE.

The sanitary prospects for Ocean Grove have been greatly improved the last year. The new driven well is shown by chemical analysis to provide a pure and wholesome water, and indicates that at other points a similar supply is likely to be secured as may be needed.

The system of sewerage has been entirely remodeled. It is based on the principle of the immediate and constant removal of all soiled liquids. Thus it is intended to avoid all cesspool storage. The continuation of pipes far out into the sea is said entirely to have prevented any return of the diluted liquids to the shore. The flushing of the pipes is easily secured and plans of upper air ventilation are being applied. While the ultimate result of all such systems must depend upon thorough and efficient administration, we can be sure that the prompt removal of all sewage will thus be secured.

Another year we shall seek to find precisely how many houses are attached to this system.

The Board of Health has been re-organized and seems to appreciate that the sanitary care of a health resort includes, not only water-supply and sewerage, but various other details which relate to sanitary, police, and public and personal health-care. House to house inspection each spring, a vigorous oversight by a competent sanitary inspector, and a book of sanitary entry which shall show the work done each day, and the inspections made, and the defects and improvements found, is indispensable to the welfare of any health resort. A reference to the annual summary will present other facts.

LAKEWOOD.

For many years that portion of Ocean county in and about Bricksburg has had some reputation as a health resort, especially for those suffering from pulmonary disease. Dryness of soil, protection from heavy winds, the influence of fine forests, and freedom from malaria, have been the distinctive features claimed. Within two years the erection of a commodious and well-appointed hotel as a winter resort has given new prominence to this inland winter home. The beautiful lake, the large pines and the lake-drive afford some local attraction. But its real advantage is in the choice of a proper locality for buildings, their construction according to the most approved designs, and their special adaptation to the purposes of a winter resort. The sanitary arrangements of the building are quite unexceptionable; each room has its fire-place and its supply of pine wood. The open and inclosed balconies are so related to sunlight and to moderated warmth as to make them genial on many a cold day.

The water of the lake contains a little iron. The rest of the mineral matter in the residue is mainly carbonate of lime. The total

solid residue, 2.77 grains per gallon, is very small, and the water owes its color to the peaty matter like that of cedar lands. It is believed by many that such districts are especially exempt from all malarial and other influences detrimental to health. We have no doubt of the feasibility of claiming Lakewood, Vineland, Atlantic City and Cape May as winter resorts, that in many respects easily vie with some more southern localities. The comparative value of those inland and those on the sea is yet to be determined. We feel sure that such a place as Lakewood is friendly to that rest and recreation which many a tired worker needs to seek in winter or in early spring.

ELBERON.

Elberon is dependent for its water-supply upon the Long Branch source. This has been improved in calibre of pipe and machinery the past year, so that the complaints of the previous year, as to deficiency at some points adjacent to Long Branch, or of insufficient pressure, are not likely again to occur. The cottages at Elberon are mostly dependent upon cesspools for removal of liquid refuse, but these are thoroughly cleaned and managed, it is believed, as well as cesspools can be. There is need to impress the thorough disconnection of cesspools from houses by means of a trap and a ventilating pipe between this and the buildings. As these cottages are mostly tributary to the hotel, there is no cooking, and but little refuse in many of them. The arrangements of the hotel deserve notice, because of their novelty. The water-closet system ends in two successive cesspools, so constructed that the overflow of the one goes to another more superficial, and so constructed as to secure safe soakage at a distance from the buildings. It has a safety method of preventing overflow which is said not to occur. The cesspools are carefully cleaned each season.

The slops and liquid refuse pass through a well-constructed grease tank, so located as to cool the liquids, and the grease is retained and removed once a week. The liquids pass to a large well-cemented cesspool in an area of the building. This is connected to an engine by an iron pipe, so that each day the entire contents are pumped out about a mile below the hotel; thus the principle of removal of fresh sewage is well applied, and the premises delivered of it before it becomes disease-breeding. Great care seems to be taken as to the details of cleanliness. Except in two or three minor particulars as to which suggestions were made, the system seems to be very efficient.

The outfall at a distance may eventually become a nuisance to that neighborhood.

LONG BRANCH.

Long Branch has great natural advantages, both for drainage and sewerage, and its water-supply is believed to be satisfactory. No system of drainage or sewerage has been adopted, and the public sentiment expends itself too much in discussion and too little in action. The hotels exhibit some of the very best, and some of the very worst, methods for the disposal of water-closet material and liquid refuse. Those, in general, are the safest which handle the vault material separately and in a dry form, and dispose of the fouled liquids by some other method. One or two hotels, which were found exceptionally bad the former year, have made considerable improvements. In others various devices are to be found. It is distressing to see the fondness for originality displaying itself in all sorts of contrivances, in order to get rid of filth by covering it up or soaking it in the ground. Ever and anon crude overseers are found giving themselves great credit for devices which leave "but ruts and botches in the work." The most of these are, perhaps, a little better than nothing, but quite ridiculous alongside the skilled methods now practised by good artisans.

One hotel has five successive cesspools of enormous proportions, and at the end a boarded and covered filter bed of the crudest construction. At one point, on account of smells, a charcoal-house is built over the cesspool to diminish the odor. The only relief was to find a common workman, who said he got up every morning before the boarders in order to smell, and that he had but one rule, and that was, somehow, to correct all smells. His inventive genius in this direction was far more protective than anything we saw, and was the only thing that made the apparatus tolerable.

In another hotel, the closets were located over a worse cesspool, and the mode of delivery was the same. In another, enormous and more elaborate brick vaults had no modes of ventilation, and nothing but the shortness of the season protects the inmates. We do not present this as a uniform experience, and find exceptions as excellent as they are rare. But we have to say, that visitors at such hotels, before taking rooms, should, at their own expense, have a sanitary expert of acknowledged skill and trustworthiness to make a sanitary inspection

in their behalf. We have already done something to correct grave errors and to interrupt the policy of concealment. But if patrons will thus seek common protection, they can insure what is their right and aid in this beneficent life-preserving work. It is the intention of the State, through this Board, to insure to the tens of thousands that resort hither for health, protection from gross sanitary neglects. Reference is here made thereto, not because such places here are any worse than those in other States, and not because Long Branch is not a salubrious and most desirable retreat, but because the self-satisfied carelessness or uninformed presumption of some wealthy owners of hotel property have made light of these defects, and they have been tardy in their correction. And we also feel that, in all these places, local Health Boards have a duty, of inspection and of general provision for the removal of all refuse and fouled liquids, which they must not overlook, as indispensable to growth, to prosperity, and to that greater length of season which all of these places have a right to seek and expect.

Some other localities have been looked at with less exactness, but a notice of these will suffice as tests of what is being attempted or done along the coast-line of New Jersey, and in some other resorts, to promote the health and welfare of residents or patrons.

This Board, in its first examination, was careful to point out defects, and, so far as is its duty, to advise or to indicate the need of expert oversight. In some cases there were ready responses. In other cases there was proper and respectful delay, until the propriety of the advice given could be tested. In a very few, there was an evident conviction that glowing statements and assertions of salubrity, and self-devised plans of adjustment would suffice. Influences of various kinds, however, have so made themselves felt as to convince most that a sanitary basis is a part of the basis of success.

It is now assured that this shore will continue to be a favorite summer resort of tens of thousands, and that not a few in winter will, somewhere in this State, seek protection from the colder climes of the North. It is also settled that they will be able to find spots where skilled and constant attention will be given to sanitary construction, appliances and administration. While perfection will never be attained, while occasionally some disease may be brought, or may originate from the neglects of a single cottage, it is certain that the rule of these cities and boroughs will be to defend health. Those that make light

of such a view and adopt the policy of boastfulness, without facts to support their claims, will receive their reward.

But our knowledge of the various Boards of Health, of the public spirit of citizens, and our determination, as a Board, not to censure without discrimination, not to conceal, and only to boast where there is ground of security, leads us to feel confident that no health resorts will surpass these in prevision, and provision for the interests of patrons as well as for the welfare and success of residents.

INQUIRIES INTO THE CONDITION OF CHARITABLE AND PENAL INSTITUTIONS.

The duties devolving on the State Board of Health in examining the sanitary condition of asylums, prisons and almshouses, made it necessary for us also to inquire into the personal and hygienic management of inmates, the methods of confinement, etc., since it is quite impossible to separate the sanitary management of individuals from that of their surroundings.

The two State asylums show a careful attention to all the details of sanitary arrangement, as well as in general the application of those principles of mental and moral hygiene which are indispensable in the treatment and care of alienism. We believe the most of those connected with these asylums are not content to accept what was long years ago regarded as the essential and established methods, but are realizing that advances made demand a corresponding change in methods of dealing with this class of patients. Indeed, the progress of sanitary science has especially developed attention to this as a department of State medicine and public hygiene. There has come to be a fuller recognition that in no class of cases is the direction of cure or of relief more to be sought in a fuller comprehension of the possibilities of good food, good air, regulated exercise, employment and amusement, and of the relation of perfected hygienic conditions to relief. Such knowledge and a closer diagnosis between the various forms of insanity will yet lead to such modifications of treatment and of management as will quite change State methods of dealing with this dependent class.

It is felt to be a great misfortune that in most cases these essentials of return to physical and mental health are so neglected that often the first regret of the State alienist is that the subject has not earlier come within the sphere of his jurisdiction and control. Morbid conditions, in part dependent on physical states, or such as could be relieved by a

regulated hygiene, too often by delay become so fastened on the victim as either to embarrass or prevent recovery. Besides the personal infliction, the ward becomes a perpetual charge to the State instead of the grateful recipient of its restorative agency.

This will never be overcome by mere advice as to early admission. Such advice rarely, if ever, reaches those concerned, and if it did would need the personal endorsement of the skilled visitant. It would be a great gain to this charity, and an ultimate saving to the State, if each one of these institutions was at liberty to send the physician in charge, or his assistant, to examine into cases earlier and either indicate as to the treatment or advise as to their early removal to the institution. Many a one would thus never need to come, and others would come at a time when the prospect for recovery would be far more hopeful.

In reference to the county asylums, it must be said of them, as a whole, that the principles upon which they are governed are radically defective. The whole system tends to put the management into unskilled hands and not to provide for inmates that kind of special expert oversight which such a disease or which such dependency demands. There is nothing inviting in frequent examinations of the insane. The freeholders, however well intentioned, cannot be expected to acquaint themselves with the exact kind of oversight which is due. We have known such men to express their deepest mortification and regret at what has been found to be occurring under their own administration.

The physicians chosen are, in some cases, selected only for political reasons, and are persons who have not made a special study of alienism. Many of them frankly say so, and say that with their uncertain tenure of office they cannot afford special preparation and expenditure. As a rule, there is no resident physician in such institutions, and more than once have we been told that the visiting physician has never seen the deranged persons unless some rare and acute attack of sickness occurs. As a consequence there are serious neglects so common as not to be regarded as neglects. The solitary confinement of the insane is the rule in a part of the county asylums of the State, and the individual study of the cases is an exception to the rule.

In some cases incompetency results from defective knowledge and the absence of experience, in others from a total want of comprehension of the problem on hand and the possibilities of amelioration which intelligent authorities recognize. We are glad to be able to say, notwithstanding this, that the larger county asylums of the State

have been fortunate in their choice of chief officers and matrons, and have faithful medical oversight.

This Board has no reason to complain, for many of its suggestions have been accepted, but it has reason to know that there are defects in the system which either need to be given up or to be under classified administration. While the idea of economy is valuable and has been reached in some of these county institutions, it has too often been at an expense of uncharity, which is a poor compensation for the saving made. So long as the State contributes to the support of these county asylums it should see to it that the care, both medical, hygienic and personal, is of the proper kind. Indeed, this would be due to such afflicted persons who had become a public charge, because of their relation to the population of the State, but is also to be urged on grounds of economy. While we are not in sympathy with any captious or sensational review of State, county, city or township institutions, we cannot but feel that the sanitary, and social, and general management of these institutions and of their inmates is an important concern of legislators. These have been accepted as wards, and while under public care we are not to lose sight of the fact that their welfare has important relations, not only to their personal condition, but to the limitation of disease, pauperism or crime. As to the insane, it is enough to say that some defects in management in local asylums were so flagrant as, upon the complaints of this Board, to lead to partial or complete change of method. In other cases the mistakes are too adherent to the system to admit of correction until the State, by its directing superintendence, secures methods that are satisfactory. Less uncertain tenure of office for those who are capable, more uncertain for those who are not, and a system by which more than one person shall determine the disposition to be made of each case in hand in accord with the highest known intelligence as to the management of various degrees of unsoundness, are greatly to be desired.

JAILS, PRISONS AND REFORMATORIES.

The same statement will, in a modified degree, apply to the penal institutions of the State. It is to be remembered that the two thousand or more that are each year to be found in the various State or county institutions are mostly under short sentences, and are, therefore, to be returned to the population of the State. Some of them are hopelessly beyond the reach of reformation and should be kept, not so

much as a punishment as for the protection of society. There is another class who should have such attention given to their physical, industrial and moral condition, as will diminish the probabilities of their repetition of crime or aid them in the work of reform. While there is limitation of the degree to which the State can accomplish these results, the limit is not so narrow as to be expressed by zero. Indeed, results in other States have shown the great economy of a wise administration of these great interests. These questions are now being studied by able jurists, and statesmen, and statisticians, not in the spirit of a promiscuous philanthropy but on exact social and political investigation. Up to this degree, at least, they cannot but command the attention of every State. How to deal with first sentences, with young criminals, with different classes of crimes; how to promote industry and yet not disturb the proper balance of labor; how to prevent such association of prisoners as shall contaminate and debase; how, in fine, to return the incarcerated to society with the best possibilities of harmless or of useful life, is a problem that no State thinks to ignore; yet, as to it, a State may be in a very inactive or detrimental attitude. In other proper and well-defined limits there should be in each State an oversight both of the physical and social future of the criminal classes. This applies not less to jails than to prisons and penitentiaries. The way that those of both sexes, or of young years, are thrown into the common jails, and the exposures in them both to physical and moral contamination, demand the judicious guardianship of the State. These subjects have received thoughtful attention from some of our legislators and citizens and need to be provided for by proper executive authority and oversight.

To some extent the same is true as to the various almshouse systems of the State, and as to all plans for the care of the indigent. Ill-health, insanitary conditions, pauperism and crime, have relations to each other, very apparent to those who trace, classify and analyze the facts in evidence. No one can visit such an almshouse as that of Hudson county, at Snake Hill, with its 800 inmates, without knowing that it means something more to the State than victuals and clothes and a retreat for the dependent poor. The same is true of other county or city poorhouses, of the numerous township poorhouses of the State, and of other plans of caring for the poor at their own homes or by "farming out."

Pauperism, unless interrupted by well-devised means of improvement, physical, social, educational and moral, does not, under present

systems, tend sufficiently to its own limitation, or to the amelioration of its conditions. These are susceptible of being wisely modified, within those limits which we recognize belong to the State in its care of the population.

Some well-regulated oversight of all these great interests that concern the deranged, the penal and the dependent classes, has seemed so desirable that now the Legislature has, in addition to the general sanitary oversight exercised by this Board, directed a Council of Charities, which will have more especial care of those questions which relate to the economic, social and ethical interests of the State as regards this portion of its constituency.

The State Board of Health has for the past year continued its inquiries into all these various institutions, so far as other and pressing duties would permit.

Our first attention was directed to inquiry or visitation of such institutions as were last year found defective, in order to find out whether suggestions made had been regarded.

In many cases it was very satisfactory to find that careful attention had been given to the suggestions made.

Some of these, while relating to details that do not need to be repeated here, secured valuable improvements in sanitary administration.

Suggestions made as to the Burlington county almshouse and asylum were in part carried out and the ventilation much improved. There is still need of a small hospital or reception building, and of some changes as to a few of the asylum inmates.

In Camden county a single case of typhus fever, which occurred and recovered without extension to others, has showed the wisdom of present isolation methods, and how wise it is to have almshouses arranged and kept with full attention to the details of sanitary and executive management.

The almshouse is now one of the best appointed in the State, and will, probably, after its costly lessons, be kept and maintained with a proper sanitary administration. An excellent and convenient separate hospital has been built.

The asylum is under the management of an efficient matron, and of a physician who, while attending to general practice, has recognized it as a duty to make a special study of alienism.

The size of the asylum, and the more definite provision of a term of office, and a compensation not likely to be disturbed by caprice or

party influence in a sphere into which such influence should not enter, will probably secure for the insane in this institution better provision than in most others.

The condition of the jail and the court house over it, as found in Camden county, has before been reported upon. It served as one of the influences which determined the need of different accommodations. While the Board has not felt called upon to give any judgment as to the expense of outlay, it feels assured that there is a common conviction that a new jail should be provided, and this is rapidly being completed.

In Cumberland county there have been some improvements since the last year. The trustees and the steward are carefully looking into the needs of both the almshouse and the asylum. There are eleven patients in or belonging to the latter. The attendants and nurses in such small asylums often stand in need of more special instruction as to their duties and the methods of skilled attention than they have received.

The jail in Cumberland county had but twelve inmates, and very few suggestions were needed.

In Gloucester county so little was found to suggest the last year, chiefly on account of the small number of inmates, that it was not deemed necessary to repeat the examination this year. All acute cases are at once sent to the asylum.

In the Hudson county institutions, at Snake Hill, some very important changes have been made. The report of the Board, made last year, led to a careful inquiry by the freeholders, and the entire water-closet system has been changed. By it, the sanitary condition is much improved.

There are still many improvements that could be made. These mostly relate to the application of improved methods of dealing with the deranged, the penal and the dependent classes. The system of county care and appointment does not secure or pay for the requisite skilled oversight and treatment. In the case of the paupers and of the large number of children there is no doubt good intent and faithfulness, but many defects, because there is not knowledge of the details now well recognized by authorities and applied in the best appointed institutions. 132 deaths among 750 inmates is a large death-rate, although, with a varying number of admissions, the average number might be stated at 1,000.

The Director-at-Large has an intelligent oversight of all construct-

ive needs, and is glad to superintend changes of which he had felt the need. A laundry, separate from the other buildings, would be a great improvement. A system of separate care of children is desirable.

The appointments of officers are many of them for too short a period. In the asylum, the appointment of ward-keepers should be in the hands of the physician or head steward and matron. While the asylum has many admirable features, it is open to criticism in the male department.

We feel confident that there is among those in charge an increasing inquiry as to methods and as to the way of promoting the best interests of these classes, and of the county and the State to which they belong.

The Passaic county almshouse has a part of it appropriated for asylum purposes. Both it and the almshouse are under one management. The building is well located, and kept in excellent order. All acute cases in the asylum part are sent to the State Asylum. Some questions of more accurate division between the pauper and deranged classes need to be considered. There were thirty-six inmates in the asylum division.

The jail of Passaic county has some of the advantages of newly-constructed buildings, and was, for the most part, in satisfactory sanitary condition. There was so much to complain of in the promiscuous mingling of small boys with those older in years and in crime that the Secretary of the Board called the attention of the proper court thereto.

In Salem county, the jail had only one inmate, and was, as usual, in good sanitary condition, except that objection, as before, was made to a form of closet in use, and to an inadequate and illy-arranged cess-pool method of delivery.

The condition of the almshouse and asylum, as to which previous complaint was made, had been slightly but inadequately improved. Although neither is very large, it continues to illustrate an imperfect system as to the care of paupers and some of the worst features of county insane asylums. The asylum was found to be a system of cell confinement in unskilled hands. The only relief to a sense of sadness mingled with disapproval, was to be found in the fact that the committee whom we met expressed their concurrence in the criticisms and assured the Board that there should be no delay in seeking and effecting important changes. The following communication shows how well they have fulfilled their trust:

"SALEM, N. J., December 6th, 1883.

"*E. M. Hunt, M. D.:*

"DEAR SIR—Your favor of late date to Jos. W. Cooper was handed to me for reply. I have not a copy of your suggestions at hand to answer in rotation, but would say that we have had a number of them carried out.

"The filthy water-closet in the insane department has been thoroughly repaired, and a ventilator carried from the closet and soil-pipe to the chimney. The soil-pipe leading from the building to the stream below has been taken out, and was found to be entirely closed up, nothing having passed through it for a number of years.

"All deposits from the closet have been running along the cellar wall, under it, and into the cellar. This pipe has all been taken out and a cesspool dug in the yard and properly walled and covered up.

"The cellar under the asylum has been thoroughly cleaned up, all filth and rubbish removed and the walls whitewashed. There is now nothing in the cellar but coal.

"The old man with a sore leg has been moved to the top of the building, where he has a good room, with plenty of light and air, much to the comfort of himself and the other inmates. The old colored man has been removed by death.

"Zinc has been put on the floors of a number of the cells. The old zinc was found to be in a very filthy condition. The old commodes have been replaced with new ones, and the slab bedsteads for insane persons on the floor, that you proposed, have been put in. We find they are just the thing needed. Straw beds are put in at night and taken out in the morning. Patients (some of whom had not been on a bed for years) all occupy them every night. Iron doors (grating), with locks on them, have been put in all the cells, so that, if necessary, they can be locked up and yet have a good circulation of air. Also one of the difficulties of keeping the female inmates more private is now overcome. There has been a woman in charge of the insane department for some time, and now everything is kept in much better condition.

"During the warm weather the patients were taken out into the yard (particularly the females) and allowed to stay most of the day. At first they did not want to go, but after awhile they looked for it. I think it was very beneficial to them.

"The pavement around the side door, that you spoke of, has been taken up and a good brick pavement put there.

"The insane department is not yet what we should like to have it, but we have done the best we could with the means at our disposal, so that there is now a very great change in its condition from last spring when you was there.

"The almshouse has also received a share of attention. The water-supply has been improved very much. The spring on the opposite side of the yard has been enlarged and a wind-pump erected that

forces the water to the tanks on the fourth floor. The water-supply is now all that can be asked. The tanks and the room in which they stand have been cleaned, and the tanks have been partitioned off, so that they now stand in a room by themselves, well lighted and ventilated.

"A new range has been put in the kitchen; also a circulating boiler, holding 100 gallons, thus providing plenty of hot water for all purposes. The bath-rooms have both hot and cold water and plenty of it. The quality of the water is good and the quantity all that could be desired. During the dry days of August and September water was plenty. The old gutter from the kitchen to the stream below has been relaid with flat stones and bricks, so that the refuse is all carried off. The stream itself has been cleaned out.

"The out-houses are cleaned every month, and the hogs are not now allowed access to them. And the yards adjoining the houses have not been overlooked. There are other points about the institution that need attention, but the present Board did not feel authorized to lay out any more money just now. We have left them for the next Board.

"It is just here I would call your especial attention, and through you, the attention of the Governor and Legislature, to the manner of conducting the affairs of the almshouse in our county. We are under a special law, which regulates our system of electing almshouse trustees. They are elected for one year only, and when the Board of Freeholders changes, as it often does, they change the trustees of the almshouse, and then a Board of entirely new men comes in at one time, and it is a year before they learn the wants of the institution. Just when they find out what is needed, they have to give way to another new Board. They should be elected for three years, and part of them go out at a time, so that all should not be inexperienced.

"We find it difficult to carry out your suggestion of getting proper persons to take charge of the insane department, as people capable of doing that kind of business do not want to live in an institution like ours.

"I inclose you a copy of the law and regulations governing the almshouse.

"Yours respectfully,

"CHAS. W. CASPER."

We have thus far noticed only those counties in which there are both jails, almshouses and asylums. It has been impossible to visit all the various township and city almshouses, but we have collected some facts as to the modes of dealing with the dependent classes in various localities and as to the causes of pauperism. It is very desirable that the State should more and more realize that it has a direct relationship to the preservation of the people not only from the taxation and expense which dependency causes, but from those greater evils which result from institutional defects. The work already done has been of great service, but much remains to be done.

SCHOOL HYGIENE.

BY JAMES GREEN, PRINCIPAL OF HIGH SCHOOL, LONG BRANCH.

It is not my purpose to attempt to deal solely with the abstract principles of hygiene. If I can but add numerical emphasis to the energetic plans already put in motion, and furnish a little encouragement by the assurance that here is one more who purposes henceforth to fight in this line, I shall feel that I have accomplished all I could expect.

Hygiene is that branch of science which treats of the principles and laws for the preservation of health.

School hygiene involves as much of these laws and principles as are contingent upon the child's attending school. This branch of hygiene is not bounded by the school premises but extends to the domicile of the child: in a certain sense it covers his school-day life. It therefore follows that, while school authorities can only be held entirely responsible for that over which they have absolute control, they are in part responsible for the child's home-life, responsible for so much of it as they may regulate by reaching out with their influence into the home-circle.

The laws of hygiene are not alone physiological, but they are also metaphysical in their nature. If we are materialists, we accept this statement at once. If we are realists, while we pause at the nature of the mysterious chord that unites mind and body, observation teaches us that their union is so complete that whatever depresses the one debilitates the other, and whatever exhilerates the one rejuvenates the other. It therefore appears that methods of teaching have as much to do with the health of the pupil as systems of ventilation, modes of carriage, diet, and physical exercise.

It behooves us, first, to glance at the evils to be guarded against or overcome in the school room; next, to consider the best means of accomplishing these ends.

It is difficult for the unskilled person to trace a large variety of ailments to a common place of either origin or development such as the school room, unless he is impressed with the idea that the body is, as a piece of machinery, one of the parts of which being out of order, the whole is deranged. So, upon any one school room evil, there may be a variety of consequents, through the child's peculiar weakness and special susceptibility.

The prominent evils of the school room may be divided into three classes, named from the diseases they promote, namely: 1. The pulmonary, including the stooped posture, impure air, drafts and sudden changes of temperature. 2. Intestinal, involving irregular meals, hasty eating and hurried stools. 3. Brain and nervous, including over-mental strain, monotonous, or cramped positions, want of sufficient physical exercise and improper light. Now, if we turn to the recent annual report of our Bureau of Vital Statistics, and to the Cyclopædia of the Practice of Medicine, we find the following: Total deaths from certain specified diseases in the State of New Jersey, for the year ending July 1st, 1881, 17,539. Of these, belonging to the pulmonary, are 5,197, or nearly one-third; to the intestinal, 3,943, or about one-quarter; to the brain and nervous, 3,144, or about one-fifth. Total amount belonging to these three classes, 12,284, out of the entire number, 17,539. Add to these figures the fact that, between the ages of six and twenty-one, near-sightedness is increased from 3.5 to 26.78 per cent. in this country, and far more in other countries; and still further add, that the schools have charge of the children at the period when they are most susceptible to these diseases, and we have evidence sufficiently startling to impress us that much must be done, and that right early.

I shall now pursue a course dangerously susceptible to criticism because characterized by specific applications of general principles; but in my judgment specific applications of general principles with criticism are preferable to the practice of some of our writers of using generalities so broad as to be susceptible of greater errors in their application than in their absence. I recently read in one of our leading magazines, three long articles urging the necessity of plenty of physical exercise and not cramming. Now, teachers may have many faults, but I never heard of their opposing physical exercise or favoring cramming. The question is, what is sufficient exercise, or what a proper apportionment of work? It is in answering this question that the mistakes are made.

I wish to prepare some material out of which to construct the main features of a model school room, and to mention in connection therewith some of the special qualifications of an appropriate teacher with a suitable curriculum, and then compare these with what some of us have. I propose that my model structure shall not be merely ideal, but practical, requiring rather increased intelligence than increased expenditure of money.

First, as to ventilation: Each person at each respiration displaces one cubic inch of oxygen by about the same amount of carbonic acid gas and vapor. To admit of this atmospheric change without detriment to health, each person must be supplied with forty cubic feet of air per minute. A room 20x30, with a ceiling twelve feet high, contains 7,200 cubic feet of air. Allowing twelve square feet of floor space per pupil, it will seat fifty pupils and grant each one hundred and forty-four cubic feet of air. Allowing each pupil to use forty cubic feet per minute, it will require 3.6 minutes to use the air of the room. To meet this demand 2,000 cubic feet of fresh air per minute must be admitted into the room. To do this without draft and consistent with maintaining a proper temperature the air should be first warmed and then filtered into the room through ten square feet of aperture, if possible divided into several different mouths, at or near the floor. An equal amount of equally guarded space should be allowed for the exit of impure air. The above figures are a medium between the maximum and minimum as laid down by the best authorities.

The light of the school room should receive careful attention. The following statistics are significant: 62 per cent. of those who graduate from the public schools of Germany are near-sighted; 26.5 per cent. of those who graduate from the public schools of America suffer a like affliction. Between the ages of six and twenty-one this near-sightedness is increased in Germany from 11 to 62 per cent., in America from 3.5 to 26.5 per cent., showing a greater ratio of increase in America than in Germany. Cohn found that of his pupils who studied out of school two hours, 17 per cent. were near-sighted; of those who studied four hours, 29 per cent.; of those who studied six hours, over 40 per cent. were thus afflicted. The eye is probably the most delicate instrument of the nervous system, and as such will most readily sympathize with any bodily deterioration. Of the various causes which aggravate near-sightedness, bad light is doubtless the most serious, and hence should receive most careful attention. The light should be admitted through

plain glass windows near the ceiling, on the left side, and equaling in their entire surface at least one-sixth of the floor space.

Let us next turn our attention to a curriculum. I fear this subject has not hitherto occupied as important a place among our questions of hygiene as the strong sympathy between mind and body, above referred to, would seem to demand. The astonishing fact that everywhere increased study is accompanied by increased physical debility seems to admit of an explanation in one of two ways; either in the increased work or in the manner of doing that work. While I am willing to concede that the hurly-burly, on-rushing, fevered haste in fortune-seeking, quantity-*versus*-quality standard, as tendencies of this new American age in which we live, greatly constrains us to an over-estimation of the amount of work that should be done, yet I incline to the view that we are to find much greater evils in the how than in the how much.

I believe that the courses of study now ordinarily laid down by the more experienced of our high school teachers, are necessary for conformity to the requirements of our most approved definitions of education. These include such a development of the useful faculties of the child as will enable him to go on developing and adapting himself to his environment, and such as are also necessary to meet the actual and just demands of the day. Let us glance at their contents: spelling, reading, writing, grammar, geography, arithmetic, United States history, a brief outline of general history, book-keeping, algebra, geometry, botany, natural philosophy and a foreign language. These units, subjected to a little variation or substitution, as the special case or local circumstances may require, constitute about the usual course.

Now, when we consider the requirements of the average citizen, including as they do a knowledge of such first principles of engineering, drainage, hygiene and civil government as are necessary, through which of the above studies would you draw the pen? But can they be accomplished consistently with the child's time, allowing for sufficient recreation and physical exercise? I believe they can. Here are fourteen branches, the fundamental principles of which are to be acquired, on an average, between the ages of five and sixteen; that is, in eleven years. For some of them more time is allowed, for others less, as the needs may be. Let us glance at arithmetic, acknowledged as one of the most important as well as one of the most difficult. To this branch is given, counting from the lowest primary exercises, a

period each day for from seven to nine years; that is, from 1,400 to 1,800 days. Now, in Robinson's Practical Arithmetic there are about seventy-five different features; thus we have a new feature, on an average, from every eighteen to twenty-four days. Does this seem to be cramming, allowing a proportionately long time to each of the other thirteen branches? I think not, when we remember that our best authorities concede to us time for study and recitation, as follows: During the years from five to seven, two and one-half hours daily; from seven to ten, three and one-half hours; from ten to twelve, four hours, and from twelve to seventeen, five or six hours.

But may not the effects of cramming be produced in a way to which our best educated teachers are most tempted? Is it not best in coming before a pupil or class to impress a new principle, to leave everything else out and present the new principle in the simplest and most forcible manner, holding it before the mind until grasped, and then entirely relax the attention? Not a few prepare the way for the introduction of the new principle by the statement of many conditions or supplementary facts which tend so greatly to detract from distinctness, as not only to produce uncertainty, but also to overload the mental stomach. There is thus a two-fold evil, continuous application instead of relaxation. The mind is overstrained and the nervous system deteriorated, not by how much, but by how.

Again, it is too common to admit to the profession of teaching persons with no knowledge whatever of the natural laws of mental growth. The child is called upon to grapple at once with principles which are the result of the mature thought of our best minds, instead of gradually approaching those principles from the concrete, and thus being prepared for the abstract. The results of all this overloading and overstraining are stunted growth and debilitation. As the same food which, bolted, is a source of great disorder, becomes a source of great strength when properly masticated, at proper intervals and with proper intervening exercise, so with knowledge. As in handling each subject we should proceed from the concrete to the abstract, so in the order of our subjects we should regard the same principle. As the closest application should be followed by the greatest relaxation, our most severe recitations should be followed by the longest recreation, and by those branches requiring least close application. On each page of our tutorial dogmas should be written, "not too much," but in bolder characters should appear, "but how well."

But the teacher is not alone responsible for the cramming effect of

the studies, much is due to the pupils' discipline at home. One of our pupils, who, while subject to the irregularities of home life, considered himself to be working hard, wrote in his first letter after entering upon the course at Annapolis, that he had never before known what work was. He soon, however, under his newly-established systematic habits, became accustomed to the work, did it with ease, and took high honors. The parent and teacher should coöperate in the establishment of systematic habits on the part of the pupil. But look how we disregard the above suggestions in our practice. Our pupils, generally, are kept in school the same amount of time, and given the same number of exercises, without regard to age, physical condition or sex.

Having indicated the proper amount of time to be spent in study and recitation at the respective ages, also the proper mode of teaching, I shall conclude by the statement of a few of the principal conditions of my model school room, and their comparison to what we have.

My model building must be located on a healthy site, and set so that its corners indicate the cardinal points of the compass; must not be set on a closed foundation near the ground, thus converting it into a suction-pump for the ground air, but must have either an open foundation or a cellar; must have the light admitted on the left side through plain glass windows near the ceiling, equaling in surface one-sixth the floor space, and shielded from glare; for the exit of impure air must have sieves set in the wall near the ceiling, and corresponding with perforated bricks or weatherboards, with the perforations dipping down and out; must have the artificially admitted fresh air led through a tube opening above the ground, and, if the building is heated by steam, taken into a drum, surrounded by a coil of steam pipe, and warmed, and thence led into the room; if the building is heated by stoves, the air shall be first led into a sheet-iron drum surrounding the stove, and then filtered into the room. We must have a course of study arranged with reference to the age of the pupil, with pliable rules of absence for girls, and a teacher acquainted with the laws of hygiene and mental growth.

I will now institute a comparison, in four respects, with my model and a few of our leading schools from which I have received partial information:

SCHOOLS.	Time for recitation per day.	Length of recess period.	Cubic feet of air space per pupil.	Mode of ventilation.	Independent of urinals No. of pupils to each water-closet accom.
Model.	proportion to age.	proportion to study.	144	sleves or air tubes.	20
Newark H. S. ..	$3\frac{1}{2}$ hours	40 to 60 minutes	180	windows.	ample.
Jersey City H. S.	4 hours.	40 minutes.	200	windows.	30
New Brunswick	$2\frac{1}{2}$ to 3 hours.	proportion to study.	130-500	doors, windo's & Boston sys.	20
Paterson	$3\frac{3}{4}$ hours.	15 to 30 minutes.	27-107	windows & Rutan system.	40
Long Branch ...	$2\frac{1}{2}$ to 3 hours.	20 to 40 minutes.	130-200	foul air tubes & windows	15-50
Hackensack	....	....	....	Rutan.	ample.
Elizabeth	3 hours	25 minutes.	160	transoms, tubes & windows.	25

The above figures indicate that, while the time devoted to recitation is generally proportioned to the advancement of the pupil, the time of confinement to the school room is uniform, and that modes of ventilation are sadly deficient; and be it observed, that these partial statistics are from our most advanced districts. Our State Superintendent's report says, that only 17 per cent. of the school buildings of the State are provided with some means of ventilation other than doors and windows.

My paper would be incomplete without some suggestions as to how to overcome these difficulties. I offer the following:

1st. Disseminate among our teachers, by some well-organized plan, a knowledge of the applied principles of hygiene and mental science.

2d. Establish the office of State School Architect, to whom all plans for new school buildings shall be submitted, and who would examine all our chief schools as to their sanitary conditions, and report what changes are needed and how they should be made.

I believe that some such plan as this would be popular, for while Boards of Education are desirous for information they have not the time to acquire it. I know of one Board that spent a large amount of money for a philosophical system of ventilation that was as philosophical as trying to pump the air out of a door-yard with a pop-gun.

Let us go on with this well-begun and grand work. There are mountains which, lifting their lofty summits into the skies, catch the first gleams of the morning sun and gradually return them till their reflection lights up the plains below; such is the mission of hygiene.

WHAT IS FEASIBLE FOR THE PROTECTION OF SCHOOLS FROM UNCLEANLINESS AND CONTAGIOUS DISEASES.

BY REV. F. R. BRACE, SUPT. OF SCHOOLS FOR CAMDEN COUNTY.

I. Subjects like the one assigned to this committee are assuming a greater magnitude every day. Populations of cities and towns are increasing rapidly, and with the increase comes the attendant danger from crowding and the evils which necessarily accompany a crowded condition. So long as a fair degree of separation can be maintained, or a sufficient space allotted to each individual, there is but little danger to be apprehended from the evils connected with uncleanliness, but when the populations begin to crowd together and large assemblages are packed in small inclosures, the dangers become so great that the necessity arises to adopt means for the protection of health and life.

The old Jewish code, in its ceremonial requirements, was not only of a religious nature, not merely to keep the people a separate people, but was a grand sanitary set of regulations for the physical well-being. Any kind of uncleanliness, arising from disease, from touching the dead, from touching any diseased or unclean person or thing, made it necessary that the person rendering himself unclean should be immediately separated from all other persons. And, according to the danger from the defilement, he must remain separated a greater or less portion of time. Then came the ablutions, the bathings, the inspections by proper authorities, before admission to the congregation. Well would it be for society to-day, for the preservation of the health of the people, if some of those old regulations could be put in force. With all our knowledge of the great laws that govern life and health, and with all

the advancement in the care of life, we might still learn much from the old Hebrew commonwealth. It was an excellent feature that cleanliness was made part of their religion. I think there can be no doubt that every community, whether it be large or small, has a right to throw around itself all necessary protection to prevent injury to physical well-being. If it be true that an individual has a right to preserve and protect his life, it must be equally true that a collection of individuals has an equal right to do so. Nay, the right of a community is greater than that of an individual, as the injury may be more extensive.

These general principles apply to the communities that we call schools. Let us make specific applications of them.

II. Under the rule laid down that crowding has a tendency to increase the danger from uncleanliness and disease, so that disease can be more easily propagated, if not generated, there ought to be a requirement of law that a certain space should be allowed each pupil, that is, a certain floor space. There should not be any huddling of four, five or more scholars together on one bench, so as to pack as many pupils in the school room as it can be made to hold. That has been done in some districts. It is still done in some districts, I am sorry to say. There is sometimes such a crowding of children, bringing cleanly and uncleanly together and into very close contact, that conditions are created to receive whatever evils arise from uncleanliness. False ideas of economy, ignorance of the common laws of health, or at least gross carelessness with regard to them, lead men to be satisfied with such a condition of things. In an ordinary school room there ought to be allowed for each pupil at least an average of fifteen square feet of floor space. This will give in the ordinary school room, an average of from 150 to 180 cubic feet of air, a quantity which, although seemingly large, will be rendered unfit for breathing in less than half an hour. When the room has the number of pupils that this limit will permit, then the door ought to be closed against the admission of all others. The room, even with the greatest attention and precaution, will become uncleanly from the deposit on desks, and walls, and ceiling and floor, of the worn-out matter thrown off from the lungs, and from the exhalations that will arise from the dirty clothing of some of the pupils. When fifteen square feet of floor space is mentioned as the limit for each pupil, it is not meant that even that limit will entirely prevent the evils from

uncleanliness, but that is the smallest amount of space that ought to be allowed for each pupil.

III. When the proper space is allowed, there ought to be a separate seat for each pupil. As a rule, no two pupils ought to sit together. It is the custom in all our homes in these days to have separate seats for the members of the family. It ought to be the custom in all our school houses to have separate seats for the members of the school. It is more needed in school rooms than in private abodes, because the system of classification according to studies will place together on the same seat children coming from different homes; one, perhaps, with body and clothing in a pure and clean condition, and the other with body and clothing in an impure and unclean condition. Thus, the one whose parents have taken pains to put him in the very best condition to preserve health, is placed in contact with one whose uncleanly condition makes him, if not a generator of disease, a fitting subject for the reception of germs of disease, and this contact is not a passing one, but one that is kept up for several hours of each day, and in a room which has often all the necessary conditions to develop and propagate diseases that are begotten or nourished in uncleanliness.

We have made a great stride forward in the sanitary condition of our school rooms by having them built larger and by removing the old forms and desks from nearly all the school houses and substituting for them the seat that will hold only two persons. We have decreased the danger that arises from placing so many together, but we must go a step further than this, and endeavor to have in all our school rooms desks that will seat only one. This is done in some school rooms already, but generally for the older and more advanced pupils, while the pupils in the primary and secondary departments are obliged to sit two on a seat; and yet it is in these departments where the crowded condition exists, and where, from the young age of the children, there is likely to be the greater amount of uncleanliness.

In the interest of health, of the proper care of the young, of the strength of the future generation, we ought to see to it that such measures as are found promotive of health, shall be adopted in all school districts.

IV. It is necessary for the teacher to see that the room has a regular air bath three or four times a day. Every door and every window ought to be thrown wide open to let the air pour through and carry

off all the foul matter possible. It is astonishing how indifferent to such matters some teachers become. They live every day in rooms that never have a sweep of air through them, rooms whose walls and desks are reeking with the foul matter that has been thrown off from lungs and bodies and clothing, making these rooms dens of uncleanness, bringing their pupils into forbearance with uncleanness and guilty carelessness, the whole being saturated each day with uncleanness. It ought to be required of every teacher that at least once during each session, after the cold weather has set in that requires doors and windows to be closed, perhaps once every hour, the pupils should be made to leave their seats and move around the room, and every door and window be thrown open for a few minutes. It would not chill the room, as walls and floor and desks are all heated, and on the closing of the windows and doors the temperature would soon be restored.

V. Desks soon become very dirty. Hands are necessarily placed on them, hands that are moist, and the dust with the moisture soon forms a coating that a dust-brush or dry cloth will not remove. The heads of the pupils are not very far from the surface of the desks, especially when they are studying and the process of expiration is throwing out used-up matter on these desks, and the process of inspiration is taking in air that has come in contact with these desks, or that has been affected with the insensible exhalations from them, and thus the air that is inhaled is to some degree poisoned. It would be well to have the desks washed with soap and warm water once a week, at all events once every month.

If any one needs convincing of such a requirement, let him examine the desks in any school room after a month's use, and he will easily see that purification by soap and water is a very necessary thing. If he is unable by inspection to see the impurity of the desks, let him try a little warm, clean water and soap, and then inspect the character of the water and see whether the desk did not need cleansing. Attention to such matters as these will produce a very excellent effect upon the pupils. It will lead them to see the value and beauty of cleanliness, and cultivate in them unconsciously a love for the clean, and an abhorrence for the unclean, that will cause them to take better care of their own persons.

VI. In our school law there is no special enactment of the duties of trustees in the matter of sanitary regulations, but full power is

given them to make all rules and regulations for the good of the schools. The thirty-ninth section, second subsection, says: "They shall have power, and it shall be their duty, to make and enforce rules and regulations not in conflict with the general regulations of the State Board of Education for the government of schools, pupils and teachers." This is very comprehensive and is really adequate for all purposes. Under this, rules can be made requiring attention to all sanitary matters. While trustees cannot determine the size of the school house, or, perhaps, the character of the desks, at least in country districts, they can determine how many shall be admitted to the room, and say to the teacher, when so many pupils have been registered, "You must refuse to admit any more." They can require that all pupils shall present themselves in a cleanly condition, and, if they do not, they can refuse them admittance. They can order that no children coming from families where there are contagious diseases, shall be permitted to attend the school.

In Gloucester township, Camden county, the following rules were adopted several years ago, and have worked well:

"Cleanliness in person and neatness in attire are expected from all. A violation of this rule will cause the pupil to be sent home to have the fault remedied.

"No pupil known to be affected with a contagious disease, or coming from a family in which a contagious disease is, shall be allowed in school."

While full authority is conferred upon trustees by the provisions of the law, there are many of them ignorant of the evils of uncleanliness and the danger arising from contagion. They have never given any attention to laws of health, and some of them consider the studies of physiology and hygiene as absolutely unnecessary. Indeed, from the condition of some of the school houses and outhouses one is almost led to believe that some of them consider uncleanliness as promotive of health. After the close of school, in May or June, the school houses are sometimes allowed to remain in their dirty condition all through the summer vacation, and when the teachers enter the houses in the autumn, they find that they are not in a fit condition to receive them or the pupils. The outhouses have also been neglected. The trustees give as their excuse that they have not had time to attend to such things. What shall be done in such cases? It is now left to the discretion and good judgment of trustees as to whether such matters shall be attended to or not. It does seem as though rules and

regulations should be drawn up, by some body having competent authority, for the government and guidance of boards of trustees, rules and regulations in which specific directions shall be given in regard to these all-important matters.

VII. It seems to me that in this and some other respects there is too great a limitation of the authority of the teacher. The teacher ought to be the supreme authority in the school room, and held responsible only for the abuse of that authority. To put one in charge of from twenty to sixty boys and girls and require him to keep them in order, to teach them, not only secular knowledge, but manners and morals, and then tie his hands, is putting him at a great disadvantage. In this matter of cleanliness, I doubt whether a teacher has any authority to send a child home to be cleansed unless a rule is first passed by the board of trustees giving him that authority. He may assume it and require every child to present himself in a cleanly condition, and if any child should attempt to enter the room without having complied with his rule, he might send him home; but, as I said before, it is doubtful whether he has any right to do so. The right to make rules and regulations for the government of pupils is committed to trustees, and yet the very necessities of the case require that the teacher shall have full control in all these matters. It is doubtful whether a teacher has a right to exclude a pupil that comes from a family where a contagious disease exists, unless a rule is first made by the board of trustees. I think that in everything pertaining to the sanitary condition of the school room, to the proper cleanly condition of pupils, the teachers ought to have full control. Especially does it seem right in these days when nearly all our teachers are intelligent men and women. With very few exceptions they have all been taught the subjects of physiology and hygiene, at least so far that they are acquainted with the great general laws of life and health. I think it is not casting any reflection upon members of boards of trustees, either in city or country, to say that teachers are better fitted to judge in these matters than trustees are, for the very reason that the majority of trustees have never paid any attention to such matters and are not called to attend to them every day. This is part of the teacher's daily work, and there is not an hour in the day when something connected with the sanitary condition of the school room, or of the pupils, does not present itself. I am aware that teachers are liable to bring censure upon themselves if they carry out what they believe to be

necessary for the health of the children, in requiring them to present themselves in a cleanly condition, and in preventing their entrance if they are not in that condition, or if they refuse admittance to children coming from families where there are contagious diseases. We are all apt to be found fault with if we attempt to perform duties that necessarily spring out of our positions, and yet our responsibility requires that we have the power to meet that responsibility.

VIII. The State Board of Education of this State have power to prescribe and cause to be enforced all rules and regulations necessary for carrying into effect the school laws of this State. Whether this gives them power to prescribe size of buildings, site of buildings, seating accommodation, character of seats, sanitary regulations for the government of trustees, teachers and pupils, may be a matter of dispute. My own opinion is that it does. General rules for the government of all schools, coming from this highest school authority, would be treated with great respect. Already a rule has been made that county superintendents shall note the condition of school houses and outbuildings. This is in accordance with the section of the school law that requires each county superintendent to report to the State superintendent any and all facts within his purview which touch and describe the location and capacity of each school healthfully to accommodate the pupils in attendance, to the end that a full observation may be deduced, favorable or otherwise, as to an ample supply of sittings, suitability of conveniences, eligibility of position, attention to ventilation, and as to all such other pertinent subjects as may clearly and fully exhibit the sanitary condition of the public schools under his official inspection. This gives no authority to the county superintendent to determine anything in these matters. All that he is empowered to do is to inspect and report. But if the law requires that these matters be reported, by inference, at least, it gives the power to the body to which the report is made to make rules and regulations with regard to the matter reported. Then if rules should be made by the State Board of Education determining what is healthful accommodation and what is detrimental to this healthful condition, it would become the duty of the county superintendent to see that such rules were observed.

It seems to me, then, that under our present law we have the means for protecting the children in our schools from anything that may

prove injurious to health, although the local authorities that have the power seldom use it.

Let me now put in brief the points made:

1. A crowded condition of school rooms makes the danger from uncleanliness greater.

2. At least an average floor space of fifteen square feet should be allowed to each pupil.

3. When the number allowed by this limit is reached, no more pupils should be admitted to the room.

4. There ought to be a separate seat for each pupil.

5. The room ought to have a regular air bath once every hour during the day, every door and window being thrown open for two or three minutes.

6. The surface of desks should be washed every week with soap and warm water; at least once a month.

7. Trustees have the power to make rules for the government of schools in sanitary matters, but they frequently forget to make them.

8. Teachers have not the authority. It would be well if they had larger powers in these matters. They ought to have the power to send any child home that presents himself in an uncleanly condition, or that comes from a family where a contagious disease exists.

9. As many trustees are ignorant of laws of health, or careless in making rules for the protection of the health of the pupils, it would be well for the State Board of Education to make such rules. If that authority is not invested in the State Board of Education, then it would be well for the State Board of Health to make them.

ABSTRACTS FROM ADDRESSES AND PAPERS OF THE NEW JERSEY SANITARY ASSOCIATION.

The second report of this Board (1878) contained an outline of and abstract from the annual meetings of the New Jersey Sanitary Association to that date. Five meetings of the Association have been held since, viz., the fifth, at the State Normal School, Trenton, in December, 1879; the sixth, at Elizabeth, December, 1880; the seventh, at Rutgers College, New Brunswick, December, 1881, and the eighth and the ninth, at the State House, Trenton, December, 1882 and 1883. As there is no printed volume of the transactions of this Association, it is of permanent service to our citizens to make brief notices and abstracts of the papers presented or the discussions which arise.

Dr. J. L. Bodine, the President of the Association in 1879, after giving various reasons why sanitary science and art should receive attention, showed why this study was impossible until physiology, chemistry, geometry and kindred subjects had been pursued, as also why it is that even yet our knowledge is so imperfect:

"Modern sanitary science, or public hygiene, is a development of the present generation, and it is coincident with the advancement of knowledge and improvement in the social condition of the dwellers in civilized communities. The Irish famine, with its large mortality from fever, scurvy and starvation, the various epidemics in recent times of cholera, diphtheria and yellow fever, the great waste of life in the Crimean and our civil war, the systematic study and registry of vital statistics, the investigations into the causation of various diseases and the conditions under which they arise and spread, and many other social influences, have powerfully aided in its development, and have caused it to be the subject of the hour—the subject for discussion and illustration in our daily press and in our popular magazines. Sanitary progress was possible, and some of the greatest triumphs of knowledge in the direction of disease-prevention really did take place in an age before ours. Edward Jenner, in the last century, as a result

of the patient observation and interpretation of a neglected fact, did show how that most contagious, loathsome, fatal and disfiguring disease, small-pox, could be stamped out by the protective influence of an artificial disease communicated by the process of vaccination; and John Howard, that greatest of philanthropists, by intelligent, self-denying and persistent labor in the accumulation and presentation to the public of the facts of the management of jails and prisons, caused the disappearance of the jail distemper and the black assizes, and so promoted prison reform that it has become the fact, a well-managed modern prison—by its cleanliness, by its equable temperature, by its ventilation, by its abundant water-supply, by its speedy removal of all excreted and refuse material, by the discipline of its occupants, by their regular hours of labor and rest, by their plain, yet sufficient diet, by their protection from changes of the weather, by their deprivation of artificial stimulants, and by their constant medical supervision, so that the beginnings of disease are prevented or treated—has become an exceptionally healthy institution."

Some of the contributions to sanitary science were then noticed:

"Of the contributions to sanitary progress, in modern times, probably no single one has been so fruitful as the discovery of vaccination by Edward Jenner, and none illustrating more clearly Christian charity and self-denying labor for others than the work of John Howard, but modern sanitary science has done much towards improving the knowledge of external conditions and surroundings in their influence upon the health and mental and moral welfare of men. It has traced the causes of diseases and the conditions under which they arise. By the aid of chemistry, and the microscope and other instruments of precision, it has shown the relations of healthy and diseased structure, the adulterations of food and the amount and kind of impurities in air and water, with their results. It has shown the relations between the ground atmosphere and disease, or, in other words, the results of the impregnation of the ground around and below human habitations with organic refuse and impurities. It has established the casual relation between a damp soil and consumption, neuralgia, rheumatism and catarrh. It has shown that drinking-water and the supply of milk may become vehicles for the transmission of the material poison of the contagious diseases. It has studied the subject of physical training, in relation to health; the methods of school management and discipline, and the kind, variety and number of school studies in their relation to mental and physical development. It has investigated the relations of heredity, training and environment to the great social evils, crime and insanity. It has shown the effect of occupation upon health and has demonstrated that by overcrowding and defective ventilation the air of workshops and factories may be made such that pulmonary diseases appear to spread from one to another.

"The earthenware manufacturer, or potter, occupies a low place in expectation of life, being below the glass manufacturer, the tool, saw and file-maker, the hatter and the needle-maker, and dying at the same rate as the inn and hotel-keeper. The occupation of the potter is by no means a healthy one. The atmosphere of a pottery is filled with minute particles of quartz and clay, which are by the respiratory act drawn into the lungs, producing, by their presence, irritation, and, in time, structural disease of the lungs. The mould-makers, who work with insoluble plaster of Paris, suffer equally with the working potters from lung disease, and the kilnmen's work is heavy and of such a character as to subject them to extreme alternations of temperature, and especially liable to rheumatic and catarrhal attacks. The dippers and some others of the operatives suffer from the poisoning of lead. Another source of bad health among the potters is the excessive use of stimulants which prevails among them; but their desire for and use of stimulants may be a result of impaired health as well as a source of continuous impairment of health. I have a decided impression, as a result of considerable experience in attending upon the families of working potters in Trenton, and from such information as careful inquiries have secured from them, that pottery operatives in this country are in better health and longer lived than in England. Our climate is drier; the workshops are new; more work is done by machinery. The lighting and ventilation of the workshops are really attended to, although indefinite improvements in the direction of cleanliness and the supply of pure and dustless air to them are possible."

The question as to the specific origin of typhoid fever was referred to, as advocated by Dr. William Budd, Prof. Tyndall and Sir Thomas Watson; while Dr. Murchisen, Sir William Jenner, Dr. Bastian and others insist that it may be developed as well as propagated by certain filth conditions.

The chemical analysis of air and water has not yet informed us as accurately and exactly as we could wish as to other sanitary conditions. Important statements were made as to the sanitary defects of Trenton.

Among the available paths for future sanitary progress, the address notices the powerful influence of heredity in the development of scrofula, cancer, consumption, rheumatism, gout and various neuroses; the influence of school life on sight and figure, and the social and financial as well as sanitary importance of a closer study of the prevention of insanity. "Our hopes for sanitary progress are the common hopes of humanity for more perfect light and wisdom; we need, for the fulfillment of our hopes, the coöperation of all men who believe that disease is a physical, a social and a moral evil, and therefore

worthy of efforts for its prevention." The subjects under consideration at this meeting were: "The Relations of Soil and Drainage to Death-rate in Jersey City, Hoboken and Paterson;" "The Sanitary Regulation of Schools;" "The True Sphere of Sanitary Laws," and "Sanitary Reform in the Smaller Towns."

The report on the drainage and death-rate of Jersey City was ably presented by L. B. Ward, C.E., E. W. Harrison, C.E., Arthur Speilman, C.E., and Charles P. Brush, C.E., with a report on the drainage of Paterson by J. S. Hilton, C.E. These reports embraced careful details as to the needs of drainage and the actual conditions of the most populous parts of Hudson county and the city of Paterson. The interest elicited was such as to attract the attention of the National Board of Health, as well as of the State Board of New Jersey. The facts revealed, as to the condition of parts of Hudson county, seemed to make it proper that in the interests of commerce there should be still further inquiry into a locality that had an extended water front, and was adjacent to the most important harbor of the country. This led the National Board of Health to make a special appropriation of $1,000 for more extended surveys and maps. The work was done under the oversight of the New Jersey State Board of Health, and, after the approval of the Board, the whole amount was paid to the local engineers and officers employed. The results are already on record, in part, in the first report of the National Board, 1879, and in the report of this Board, 1880, pages 48–63, while so much of the report as relates to Jersey City is on file in this office. As these reports are already accessible in print, we need not abstract here, but only refer to the important aid furnished to the work by the preliminary efforts of this association.

In a paper with regard to the sanitary regulation of schools, with special reference to the control of infectious diseases, Dr. H. A. Hopper, of Hackensack, urged the relation which all public and private schools bear to the extension or limitation of disease. We present the following abstracts from this paper:

"The limitation of the spread of contagious and infective diseases, whenever they make their appearance in any community, is, and will always be, a matter of deep concern to the sanitarian, and this concern must extend to a desire for their entire suppression. Most particularly when it involves the safety of a class of our population, whose tender years and helpless dependence appeal strongly to the guardianship of parental affection and through it to a publicly-applied hygienic philanthropy.

"In the midst of our boasted improvements in sanitary plumbing and our knowledge of preventable disease, we find that in many city school buildings exhalations from badly-ventilated and worse-washed water-closets, as well as from entirely unventilated soil-pipes, are constantly permeating the class rooms. Inspection will bring almost daily proof that the ground floors appropriated for recess enjoyment are almost entirely shut in from the open vaulted sky above, and thus from the true source of pure air. This multiplies the avenues of enervation, and constantly defeats the noble design for which such places were instituted—the replenishing of wasted physical force.

"The country school house is amenable to as severe criticism for its defective appointments and surroundings. Such establishments can, with very few exceptions, boast of the convenience of their privy vaults in close proximity to the school building, their contents very rarely removed, sending up the gaseous products of organic decomposition, which are wafted by favoring winds through open windows to regale the nostrils of patient—because disciplined—inmates, and scatter the seeds of disease among them. In this connection it is no uncommon discovery to find such privy vaults with uncemeted bottoms, in loose, gravelly soils, percolating their liquid contents through subterranean streams to reach the nearest well or spring from which the potable water-supply is derived to meet the thirsty demands of the teacher's wards.

"On account of these and other multiplying facts, quite as important, the subject of sanitation in connection with school management addresses itself with peculiar force to the consideration of the thoughtful in every community.

"In order to deal practically, instead of theoretically, with the subject, we propose to present a few tabulated statistics, as a basis for the suggestions which are herein made, for the consideration of this association. The mortality rates of early life, growing out of infectious and contagious factors, it will be found, are so large as to become seriously suggestive to the sanitarian, and should prompt investigation for the discovery of the possible, and probably fruitful, sources of them, and at the same time lead to the most earnest inquiry for the best means to be employed for their abatement.

"By consulting the *Bulletin of Public Health*, we find that the following average monthly data since April, 1879, present a table of no small proportions in illustration of the whole subject.

"Tabulated reports from twenty-three towns and cities, representing nearly every section of our country, and including a population of 6,000,000 souls, exhibit more or less perfectly the monthly death-rate:

Scarlet fever	440
Diphtheria	400
Measles	200
Whooping cough	124
Total	1,164

"If we multiply these figures to represent the annual mortuary account, we will have, in a population of 6,000,000, nearly 14,000 deaths from diseases incident to early life, of the contagious and infectious type alone. This death-rate, we must bear in mind, does not represent the true number of cases of disease of the class just named; but for a more satisfactory presentation of the number of cases occurring, we may refer to the statistics of the city of New York, with a system of Health Board and vital statistics as nearly perfect as is practicable, and reach an approximation to the truth, which can be made applicable to our own city and village population so nearly, that we will not fail seriously in reaching a conclusion as to their importance, and the duty of the State to her citizens, to provide some relief, by the direct or indirect appointment of local Boards with authority suited to local necessities, for the removal or stamping out of the causes of at least some of our infectious and contagious diseases. For the five months inclusive, from July 1st to November 26th, 1879, we find reported by the city authorities the following number of cases:

	Scarlet Fever	Diphtheria.	Measles.
July	236	92	80
August	305	140	218
September	331	173	89
October	135	117	119
November	162	151	316
Total	1,169	673	822

"In one city, therefore, we have a report of no less than 2,664 cases in five months, of that class of diseases alone which are peculiarly liable to occur in early life, and hence probably largely affecting those likely to be found in schools, both public and private. This, too, in a city where the untiring industry of its health officers aided materially by school authorities, has been to a considerable extent successful in its mission, and such labors give promise of greater future usefulness. It is to be regretted that our own system has not yet reached a point of perfectness adequate to the recording of all cases of disease with the same exactness as our death record, and cannot, therefore, be resorted to and made available for exact statistical record, but our death-rate warrants the conclusion that our largest cities and smaller towns will not, in the aggregate, fall anything short of the above, in proportion to their populations.

"It is not claimed that, in these figures, we have reached a point of exactness, but one of probable approximation, which is more likely to be seriously increased than pleasantly diminished, if the whole could be obtained. In the absence of any records on this subject, connected with school management, we are unable to say how much of infectious spreading may have been due to carelessness or entire disregard to the danger of converting endemic into epidemic increase of malignant disease, both on the part of school authorities and private families. It

has too frequently happened that indifference in this matter has spread death, dismay and domestic distress, together with pecuniary loss, to individual families and whole communities.

"Where no legal restraint has been imposed, the experience of every observer records the fact that children who have been detained from school by illness, for even a short time, have been hurried back to studies often by foolish ambition to recover lost positions in their classes, and in many cases to remove them from the irksome care of domestic supervision, the germs of disease being carried with them in the clothing worn, or, as in scarlet fever, by means of the desquamating cuticle adhering to the person. For the correction of this evil, we ask for authority with legal power to enforce it in every hamlet and school in the State.

"Pertinent to this matter is the consideration of an apparent indifference to danger in our day, which has frequently made our halls of learning pestiferous propagators of disease and death. For the truth of this statement the testimony of scores of observers stands pledged. We need not spend time in multiplying illustrations when we can turn to the report of our own State Board of Health concerning the Jamesburg disaster, which was of very recent occurrence. In pursuing this study, let us profit by the lesson taught in the investigation made by that industrious sanitarian, Dr. E. Harris, into the causes of a fearful scourge, which sent death and dismay into the homes of no less than twenty families in the township of Newark, Vermont, last spring, through the district school, and by means of only two pupils, carelessly and too early returned to the school after an attack of diphtheria. The investigation tells us that from so insignificant an origin, of ninety-two persons residing in the families affected, forty-eight suffered with the disease. If healthfulness of natural locality could contribute anything to prevent such an issue, we can find it there. The doctor tells us that 'although located amidst the steep hills of Vermont, in one of the most salubrious regions, where the annual death-rate seldom exceeds fifteen in the thousand living inhabitants, and where nature proffers the purest air and water, with ample nourishment and separateness of families, are witnessed the combination and progress of the causes which enter into the most rapid and destructive propagation of malignant disease;' nor are we informed that by the law of natural selection the disease weeded out only the feeble and left a more vigorous race to populate the desolate region. More probable is it that in many cases some organic lesion is still telling the story of wasted physical power baffling the best scientific skill."

A valuable paper on "The Domain of Sanitary Legislation," by E. S. Atwater, of Elizabeth, which was read at this meeting, has since been published in the report of this Board.

In a paper on "What has been Done and what Neglected as to

Sanitary Reform in the Oranges, Bloomfield and Montclair," J. C. Bayles, C.E., editor of the *Iron Age*, detailed various efforts that had been made to remedy evils arising from the disposal of excretions and garbage, from the absence of a sewer system, and from the need of a more reliable water-supply.

It is believed that this paper, together with other local efforts, has contributed much to awaken the attention of the citizens of these districts to their sanitary necessities, some of which have since been well provided for.

At the next annual meeting, held at Elizabeth, the address of the President, L. B. Ward, C.E., of Jersey City, was a historical survey of the progress of sanitary science and legislation abroad and in this country. He gave a clear and exhaustive history of sanitary legislation in England, which we have not space to reproduce. It regulated streets and buildings, the water-supply, sewerage, drainage, sewage utilization, nuisances, adulteration of articles of food and drink, analyzation of food, and penalties for adulteration and other matters of a similar character. From time to time, various acts were passed touching these matters with ever-widening authority, until there has grown up a vast sanitary system, the details of which will bear the most careful examination and application here, as far as our circumstances will permit.

The President then dwelt upon the importance of the National Board of Health work, which owes its existence to the yellow fever epidemic. Sanitary administration in this country is still in its infancy, and its object has hitherto been principally to collect information for future deductions, and local Boards are clothed with little more than police powers. But governmental powers should be expansive and progressive in this respect, and reference was here made to the varied and progressive experience of England in the application of sanitary laws. This legislation was influenced by and began with three outbreaks of cholera, which led to investigations of the means of preventing or mitigating infectious diseases.

The early work of Massachusetts was then traced and its valuable relations to the progress of sanitation shown. Also, the history of our own State Board was outlined, and its work reviewed and commended.

In addition, the special work of the Bureau of Vital Statistics was alluded to. As to the death-rate, except in Hudson county, Paterson and Newark, nothing certain was known in regard to it, previous to

the passage of the existing law. Returns of births, marriages and deaths were generally very loosely made. Under the present law, the returns of vital statistics are made to a competent officer, who shall examine them carefully and prepare the proper tabulated statements as to the causes and sources of death, sources of social progress and deterioration, and report annually to the State Board of Health, which reports shall be published as part of the report of the Board. By this means, the reports of deaths are now believed to be practically correct.

Mr. Ward next dwelt upon the sources of water-supply in the northern part of the State, and thought that the establishment of private water companies should be fenced around with proper safe-guards and restrictions. Among the powers which the Legislature must intrust to local authorities is that of borrowing money on the security of local resources, for the construction of works necessary for the public health or desirable for the advancement of the community. As he had given personal attention to a study of the water-sheds of the State, his remarks on the subject were of much value.

In addition to the matters discussed in this address, the inspection of buildings, the subsoil drainage of cities and towns, the examination of wells and control of their use in cities, the diseases of animals in their relation to human diseases, and drainage for health and the power to condemn lands for this purpose, were the topics which came up for consideration.

As to the inspection of buildings, reports were made as follows:

J. C. Bayles, of Orange, among other things, said: In making a thorough inspection of a house, let us begin with the cellar. It needs to be dry and clean to be safe. Not many cellars in city houses have perfect drainage and ventilation, and such as have not should be given a thorough cleaning. The main drain, leading to the sewer, should be iron, extending at least through the basement wall, and the outlet should be free and the pipe without leakage, else it causes dangerous saturation of the soil. Next in importance is the soil-pipe, which rises vertically from the cellar. Each joint should be inspected, and it will do no harm to call in a plumber to your assistance. It should be condemned when not found tight, or when not carried through the roof. The fixtures of the closets are often the cause of great trouble, and he would condemn all the closets that are built in small pantries that have no ventilation, and open only into a hall or bed-room. The custom is to waste baths and basins into the nearest closet traps, but such traps are what their names designate.

There should be vent for every trap in the shape of an air-pipe, and with this vent and an open air-pipe there is no danger from closets in houses. All the branch wastes need looking after, and it is better to give them a vertical waste-pipe of their own. Slop hoppers on the upper floors, though seemingly necessary, are causes of trouble, and should be flushed out.

Some additional points were presented by Prof. Jacob Cooper, of New Brunswick: . His subject was, "The Proper Sanitary Conditions of Buildings in the Country." In treating it, he said he would consider, first, the natural location; second, the interior structure; third, the artificial surroundings. Level plains are less likely to be healthy than undulating country. The house should front the south, and be located west or south of a public road, on a slope, yet not at the bottom of a hill. Drainage is a prime condition of health. The well should be a little higher than the house, and the sewers should be carried far away. No sane person will construct a cesspool in the vicinity of any building for man or beast. Natural forests should be on the northwest, north and northeast, but no trees very near the house on either side, and no sunlight should be cut off. Regard should always be had to sunlight, and the kitchen should be toward the sun, while the parlor and spare rooms, less used, should be on the north side. The internal structure of the house should compass drainage and ventilation. It is hard to fight against nature; water-closets should never be in the house, but in an addition, not opening in it nor in connection with it, but reached by a covered way, and should be such as can be disinfected all the time. The contents should not pass into a subterranean drain. Such closets do no harm and do much good. The bath may be in the house but not in the water-closet, and though it is not so convenient to have the closets outside, the annoyance is in no proportion to danger of having them in the house.

Ventilation in the country presents but few difficulties. There should be in every room a fire-place, whatever the means of heating the room. It is worth more than any other method, and an open fire, by blaze of wood or the coals of fire, causes the circulation of the air to be perfect. It is the most simple system devised. In reference to cellars, Professor Cooper said they needed more precaution than care. They are not to be used for all the vegetables of the farm, nor for more than are needed for the present, for the evaporation is disagreeable and dangerous when they begin to decay. The dish-water and other waste water of the kitchen can be used to feed grape vines,

which are proverbially hungry. The outbuildings intended to house cattle of every kind should be at the east or north of the dwelling, so that the prevailing winds, which are from the west and south, would blow the odors away from the house. They should not be close to the dwelling, not less than 300 feet, and on sloping ground. No standing water should be permitted in or about them. Liquid manure should not be left in the center of the yard, but should be led away and taken up by muck or some other absorbent. The floors of the stables should be inclined, so that they could be constantly drained off, and all the outbuildings should be lower than the surface of the water in the spring or well. All animals require pure air and should not be crowded closely in stables where there is not free circulation. Even the pig-pen and the hennery should be well cleaned and ventilated, and no animal should be fed with spoiled food.

Prof. H. B. Cornwall, of Princeton, next spoke on the same general subject:

Cellars, he said, should be well ventilated and dry. We may presume we have a good cellar if the bottom is clean, yet he gave an instance of sickness in three houses that were built over a place upon which a privy had stood, but which had been cleaned out, filled in with new earth to the depth of six or eight feet, and a coating, four inches thick, of cement placed over that, on the bottom of a cellar. Yet ammonia was formed in that soil in large quantities. The drainage should be good, but the question in the country is, What shall we do with it? The easiest way to get rid of all the drainage of a house is to run it off to a cesspool. There are certain circumstances where that may be allowed. If we have a large lot, the soil gravelly, not sandy, extending fifteen or twenty feet, or more, and then striking a sound rock, under such conditions, a cesspool 75 or 100 feet from a house, and a well and a properly-ventilated connecting pipe, leave very little risk. The danger is in a sandy soil, or where it beds on a seamed rock, where it is traversed or seamed by vertical joints that are apt to be open. These carry the water anywhere. They have been known to carry the drainage seventy-five feet to a well. In the towns where lots are small, where they empty out in fissured rocks, or where they meet clay, they will not do; and the question in cities, What are we to do with our sewage? is one of much importance. There are two ways, other than running it off with water. They are, first, to let it run over the ground; second, where the lot will permit it (where the water does not contain fœcal matter), use subsoil irrigation. It is

expensive, but there are numerous books to show us how to do it. The earth-closet will serve the purpose if well taken care of.

Prof. Cornwall referred at length to well-water, and analyzed it, with a view to finding causes for typhoid fevers and malaria. He questioned if there was any direct connection with water and malaria, never having heard of a case where chemically pure water ever caused malarial fever.

For a water-supply in the country, dig a well—and an open well; protect it by a cemented well, six or eight feet below the soil; fix the surface higher than the land around, so that rain-water can't flow into it; and when contamination is discovered, remove the cause. It is not necessary to do more, as the well will generally do the rest itself, in time. The cistern water-supply is best in a small town. It is free from privy contamination, and a well can't be depended upon in this connection. An old shingle roof is good, but a slate roof is best, to gather water from; but do not use the water of any rain-fall that does not thoroughly cleanse the roof. The water will be very soft, but as pure as can be. It should be thoroughly cleaned out at least twice a year. A newly-cemented cistern will give hard water, but it will cure itself in time. Filters—there are cases where they are good, but they should not be relied upon, as they become so impure that if you put perfectly pure water in it, it will come out impure. The distribution of water through a house should be through iron pipe. Pure lead pipes are not good, for, though spring-water does not long affect them, rain-water will continue to act on them as long as used.

The paper of Ashbel Welch, C.E., on "Subsoil Drainage," has since been published in one of our reports.

Dr. H. A. Hopper, in a paper on the "Sanitary Examination of Wells, and How to Control Their Use," emphasized the dangers to public health arising from the use of impure water, and claimed for the public a control over all sources of water-supply. This paper has an important practical bearing upon questions constantly recurring, and so is given with but slight abbreviation:

"First among the facts we present is the commonly accepted truth that the quality of water is fixed by the character of the soil through which it percolates. It may hold in solution or suspension a large amount of mineral or earthy matter. It may be alkaline or contain the salts of iron alumina, silica or even chloride of sodium. It may contain ammonia or phosphates derivable from the soil constituents, or, as in the case of ammonia derived from the atmosphere, descend-

ing with the rains, and be free from deleterious influences; but much of the dangerous combination which may be found in solution must depend upon the source of derivation of the water. Ammonia—harmless when derived from rain-falls—often is the result of organic decomposition, and when associated with the organic substances from which it has been evolved, becomes a dangerous constituent of the water in which it is held. Such organic impurities in water challenge the closest scrutiny, and require investigation to discover their sources. Although ammonia and nitrogen in a free condition, as may be inferred from the preceding statements, may be entirely innocuous, in some of their combinations they do become dangerously toxic in their influence upon the human organism. Water, by its solvent power, is capable of holding in solution, to some extent, at least, whatever comes in contact with it: rain and snow as they descend through the air carry with them particles of dust mingled with the germs of animals and plants, which, under favoring seasons and atmospheric conditions, may multiply and die, and thus become sources of putrescence and of that chemical change known as organic decomposition. In some localities open wells are largely supplied from hillside springs, whose streams run through low, marshy fens, and carry, with very little filtering through the soil, the products of such decomposition; but with this source of contamination we shall deal less in this report than those larger and more decidedly prevalent reservoirs of pollution which abound in thickly populated districts. Professor Chandler, of New York, asserts that as an impurity in water is almost always present, we have organic matter whose exact chemical character has not been fully determined. This, he says, is a collective term for a great many different substances derived from decomposing vegetable and animal matters. Although we may be at present reduced to admissions of defects by reason of the imperfect demonstration of some of our scientific problems, practical familiarity with the deplorable results of the neglected warnings scientifically given, concerning the dangers to health and life, from the unconsidered sources of our well-water supplies, should demand a larger share of our daily investigation than is usually accorded to them. Treatises almost exhaustive of this subject have come from prolific pens to a very large extent, and still the demand for agitation of its life-saving truths are continually made upon the teachers of social science problems. Frankland, Letheby and others abroad; Chandler in the papers of the American Public Health Association, Jules Lefort in the *American Chemist*, and Professor H. B. Cornwall, of Princeton, N. J., and Dr. Pinkham, of Montclair, N. J., before this Association, have so carefully discussed the present and prospective of its influence on the lives and health of communities, that the literature of the subject is so full it appears to be just now a supererogation to attempt to add anything beside some practical observations for personal use and the guidance of Health Boards in the discharge of their duties

to the people, for whose safety they hold their appointments. First in the series stands the necessity of a careful examination of the surface surroundings of any given well requiring examination. Next to this an investigation of the character of the soil strata and depth from which it is derived. Of the first it may readily be understood that the duty of the careful sanitarian covers a wide field, in which he is likely to encounter hereditary prejudice, domestic convenience, and too often the cherished plans of the enlightened (?) architect; and it not infrequently happens that limited ground area seems to demand certain relations between the dwelling, well and privy vault. In every case where those relations are inconsistent with the strictest rules of sanitary propriety, a decided judgment, based upon hygienic considerations, should be expressed in terms not to be readily misunderstood. The examination of the local surroundings of wells includes suggestively a review of some of the practical literature of the subject, and it will not be amiss at this point of its consideration to refer to reports and opinions in confirmation of its necessity. Prof. Chandler, in his report published among the papers of the American Public Health Association, says: 'In many cases, from the proximity of cesspools and privy vaults, the water becomes contaminated with filtered sewage matters which, while they hardly affect the taste or smell of the water, have, nevertheless, the power to create the most deadly disturbances in the persons who use the waters. In the neighborhood of grave-yards the water of wells is often impregnated with animal matters from recently-filled graves.' The popular and wide-spread belief that to effectually 'dispose of decomposing organic matter, it is only necessary to remove it from sight by burial in the earth,' is founded, no doubt, upon a half intelligent trust in the power of the soil to retain or neutralize in some way, all organic matter from solutions. This has begotten an indifference to the subject of soil saturation and filtration. As a result, the wells in many large cities, as well as those of extensive rural districts, are receiving pollution from privy vaults, cesspools, cattle-yards, and even cemeteries. Strange as this may sound to the intelligent investigator of to-day, its proof abounds in every direction. Dr. Vaughan, of the University of Michigan, in a paper read before the Sanitary Convention of Detroit, this year, January 7th, 1880, says: 'During the past three months the authorities of a growing village in the interior of this State have, in spite of the remonstrances of many citizens, located a cemetery within a few rods of a deep well, the water of which is used for household purposes.' That the danger of such practices has been for a long time appreciated by careful observers, needs no special proof, notwithstanding the present widespread indifference. In an article by Jules Lefort, in *American Chemist*, Vol. II., page 448, he declares that 'as long ago as 1808 it was decreed in France that no one should dig a well within one hundred metres (about 330 feet) of any cemetery.'

"In our presentation of the branch of investigation covering sur-

face surroundings, we include necessarily some of the serious results of its neglect. A few examples of such results are of value for a demonstration of fact above the fallacy of conjecture. Sudden outbreaks of disease, sometimes of a gastro-enteric type, and at others of a purely typho-malarial fever, often follow the unsuspected ingress of sewage matter into the well, either from leakage from soil-pipes, cesspools and other contaminating sources, and more frequently by gradual percolation than by sudden irruption. From such a source, at a convent in Munich, thirty-one out of one hundred inmates were affected with typhoid fever. At Pittsfield, Mass., a large number of pupils in a boarding school for young ladies were similarly affected. The history of the case given recently by Professor Cornwall, as having occurred near Princeton, N. J., of the colored man whose typhoid disease was communicated to a number of others through the use of well-water, is too familiar to you all to need recapitulation. What shall we say of the late calamity which befell our ancient seat of learning at the city just named, where modern vigilance failed to discover those surface surroundings which should have averted the cause thereof. The force of this reflection is not diminished by the consideration whether or not it may have happened in part from poisoned atmosphere in conjunction with polluted well-water, but it presents the fact as its own unpleasant commentary. It is not necessary to multiply examples of this kind by a recitation of dozens of cases which have been reported in our own and neighboring States; but it is well to bear in mind an important practical fact pretty well conceded by nearly all scientists, that water once contaminated by sewage, especially that containing the detritus of certain diseases, may communicate those diseases after an apparently thorough purification. Professor Cornwall, in his paper published in the second report of our State Board of Health, says 'that it is not possible, within certain limits, to say how long a dangerous water will continue to be dangerous; still, analysis very often serves to detect danger where it was hitherto unsuspected.'

"We are quite safe in concluding that this view of the matter in its relation to well-water is entirely correct, and not subject to those restrictions placed upon the views of scientific experts, who, like Dr. Frankland, conclude that all waters once contaminated by sewage poison are never afterward fit for use; while Dr. Letheby, Dr. Miller, Dr. Parkes and others insist that waters of open streams do purify themselves after the processes of passing along several miles subjected to oxidation, fish feeding, &c., and become entirely pure. This point is made with special reference to the control of well-water used in cities. In regard to the next consideration named—the depth and soil strata through which the well may be obtained—we are likely again to meet with popular delusions which have been largely fostered and developed by the teachings of well-informed *quasi*-experts. Chief among these errors is the idea that a rocky bottom, particularly

one with drilled holes to reach a water-supply, must be exceptionally safe from surface contamination; putting out of mind an important factor which may make such wells exceptionally unsafe—we allude to the possibility not only, but in our own State to the probability, that the perpendicular fissures and longitudinal or horizontal and irregular strata seams of sandstone, shale and even trap-rock formations, may afford a more direct conduit for unfiltered sewage, than a compact, loamy soil. It is no less important that the idea of perfect safety attached to driven wells should receive a check by explaining the term as only relative. Cleanliness from direct surface wash is well secured by that kind of water-supply, but in all other respects it is subject to the same regulations and restrictions to be applied to the stone-built or cement tile-pipe well. What influence is exerted by different soils in the removal of sewage contaminations for the protection of well-water from pollution? This is eminently a practical question and must sooner or later be intelligently answered, not by chemical theorizing, but by practical experiment conducted in particular and special localities, for an enlightened guidance of the dwellers on the soil. The importance of it will be understood when we consider that after near local surface surroundings have received due attention, distant sources of danger may exist to awaken apprehension. We are able to answer this question only in part, and in doing it must have recourse briefly to some experiments made in a distant State, suggestive of what made be done at home.

"At Ann Arbor, Michigan, in 1878, the discovery was made of offensive water in a cistern which was twenty feet deep and found to leak six feet under the surface of the ground, affording through the opening as good opportunity for the ingress of sewage as for the egress of all water above that point. An investigation into soil power for filtration, oxidation and thus purification, was made for the testing of different soils, and an answer to the question, Do different soils differ in their capabilities of removing organic matter? This was done with special reference to the removal of organic matter held in solution, and not merely in suspension; the latter is all that can be pretended for any filtering apparatus usually employed for cleansing drinking-water. The conclusions reached were used with especial force against the location of cemeteries within even long distances of wells, and concludes with this language: "We honor the dead as highly as others do, but it is not right that the dead should be allowed to murder the living." If, in the sanitary examination of wells, occasion arises for the special examination of the water of a suspected well, recourse must be had to chemical agency. Many methods have been suggested in connection with the examination of different classes of water, and whether one method or another be employed in the analysis, a classification of substances occurring or likely to be present must be observed, and will always include matter in suspension or in solution, either organic or inorganic, solid or gaseous, animal and vegetable. The bibliography of

this department is so extended that an attempt to compile a small part of it for this report, is impracticable. Having traversed the ground to some extent pointed out by the naming of this subject, we need only to add to the matter of inspection that the deeper the well, all other things being favorable, the less the danger of contamination, especially when the boring is through a heavy strata of clay, or what is popularly known as hard-pan, which will for a long time resist the percolation of surface-water. Artesian wells, although too expensive for general adoption, when sunken to great depths, afford a more perfect security. If, however, strict attention be given to surface surroundings, and soil advantages and disadvantages, we will hear less frequently of the dangerous outbreaks of endemic disease. A review of the facts presented in the discussion of the first part of our report points unmistakably to the necessity for some restrictive supervision of the indiscriminate use of wells in cities where, no doubt, long before urgent sanitary necessities existed, such wells were built regardless of increasing filth deposits above and around them."

At the meeting held at New Brunswick, December, 1881, Dr. Hopper, as president, treated of the "Danger in Noises," and discussed the question how far excessive and unnecessary noises should be brought under the restrictions of law. Reference was also made to the sufferings of the traveling public as follows:

"Imperfect, and sometimes impossible ventilation of railroad cars, became a source of such persistent and loud complaining that improved construction has now presented within our reach, as we delusively think, a correction of former wrongs; but while improved facilities are afforded for the correction of an over-heated and vitiated car, the stubborn or careless persistency of railroad employes in opposing a proper use of the means provided, is a subject of almost universal complaint. The conductor will very blandly promise suffering passengers to find a man who will regulate the ventilators; the brakeman, in turn, growlingly declares that he cannot warm the cars with the ventilators open; the resulting issue is, continued suffering, until some passenger, bold enough to move, applies the remedy. Contagious and infectious diseases frequently find a favorable means for propagation in the unventilated and miserably cleaned railroad car, and until some terrible calamity stares several communities in the face and calls out the activities of National and State Boards of Health, very little of well-directed effort is made in the direction of a proper cleansing of cushioned seats and bespattered floors. Perhaps we may find some grains of comfort in the lengthy correspondence between the National Board, a few State Boards of Health, and the Pullman Car Company of Louisville, under the threatened spread of yellow fever in 1879. All of this is as it should be, but the forced cleanliness of a dire emergency should be made the rule, and not the exception, to daily management

in the interest of public health. Another and quite as important matter, in connection with railroad sanitation, is the architectural construction and daily management of passenger depots.

"It has grown to be a crying evil against which public protest should be made, that, in a great many instances, to avoid the contraction of filthy diseases, passengers are compelled to wait for coming trains outside of depot buildings. Badly ventilated waiting-rooms and disgracefully located and managed water-closets, are constant sources of danger to the traveling public; but, as was intimated in the early part of this paper, the easy, idle manner in which our people take these perils by constant familiarity with them, points at once the lesson and the duty of those vested with authority for their abatement. Public opinion must be educated into a calm, grave consideration of the dangers as well as the offensiveness of those places built ostensibly for convenience and comfort.

"Local Boards of Health possess the power, under our sanitary laws to-day, to direct and control the construction and management of railroad depots, with their adjuncts, in the interest of public health, with quite as much success as they can exercise supervision over the plumbing and surroundings of private dwellings, school buildings, court houses, jails and almshouses."

The subject of small-pox and vaccination came up for extended discussion. The facts furnished were somewhat conflicting as to the relative indications for the use of the lymph, derived from spontaneous cow-pock, as introduced by Jenner, or the more recent advocacy for the use of lymph at first similarly derived, but transmitted from calf to calf instead of from arm to arm.

Dr. H. R. Baldwin read a paper which gave a history of vaccine inoculation, embracing important quotations and opinions on the subject of vaccination from the earliest times, and from standard authority. This paper was important and deeply interesting to the medical members of the Association. He condemned the wholesale vending of vaccine virus by apothecaries as tending to mischievous results.

Dr. Dennis, of Newark, followed with some practical remarks on the question of vaccination. He took the view that there was necessity of great care to secure the purest vaccine virus. He gave statistics to show that among the unvaccinated the mortality reached 35 per cent. Among those imperfectly vaccinated the mortality was 21¾ per cent. Where one mark was shown, 7½; two marks, 4½; three marks, 1¾; four marks or scars, which is proper vaccination, the mortality was only three-quarters of one per cent. Further statistics of interest to the medical fraternity were given. The conclusion

reached from these tables was that at least thirty unvaccinated persons died of small-pox where one died not properly vaccinated. He favored the use of bovine virus, and, to secure the greatest protective power from vaccination, he would favor the making of four marks or scars on the subject.

Dr. Baldwin spoke of the German plan of continued applications of virus at intervals of three days, until the virus ceased to take effect, and until the system was saturated with it.

Dr. Williamson said his plan was to make a large mark and spread the virus upon it thoroughly. Sores have been as much as parents or children could stand from one application of virus, and if there were four spots an inch apart they would run together. The better plan, he thought, was a repetition of vaccination two or three years after, if parents would be willing.

Dr. Hunt read extracts on this subject. He suggested that physicians labored under one great disadvantage, in that they did not know what kind of lymph they were using. He thought physicians should be exceedingly inquisitive on this subject.

The subjects of "Tube Wells and Water Filters" were presented by Prof. Cook, of New Brunswick, and J. C. Bayles, of Orange.

Prof. Cook discussed the whole subject of driven and bored wells, showing when and how each were applicable—their value in some cases and their failure in others. He showed that the water of deep wells was not generally to be considered as the rain-water of that season filtered through the soil, but rather as resident water which had been stored there for long periods; such wells, therefore, are not so easily affected by drouth. He expressed the opinion that a water-supply along our sea-shore would yet be found by driving wells deep into the lower marl strata, and gave some statements as to wells that have been put down in various localities.

Mr. Bayles showed how imperfect are most of the water filters in use, and that many of them merely detained coarse particles and in no other sense purified the water. Filters made by a brick partition thus strain the water and retain organic matter until the bricks themselves become foul and can only be cleansed by their removal. He expressed the opinion that spongy iron is the best filter material, but a good preparation of it is not now to be had in this country. Next in value is the magnetic iron ore, which is easily had in a coarse state. He objected forcibly to the use of zinc water coolers, inasmuch as the zinc

contains much arsenic, and is otherwise objectionable. The Kedzie water filter is the best one now in use, if only the zinc receptacle is replaced by galvanized iron or some other material.

The eighth annual meeting was held December 14th and 15th, 1882, in the Senate Chamber, at Trenton, and was one of the most useful meetings of the Association.

The address by the President, Prof. J. Madison Watson, of Elizabeth, dealt chiefly with the subject of "Social Sanitation." Only a few of the more important suggestions can be quoted:

"Sociology recognizes humanity as a triple unit, naturally divided into the family, the State and the church. These social divisions are not man's invention, but the outgrowth of his nature. Beginning from the sexual relations, all the family conditions are fulfilled in a society of two parents and their children, united by free choice, by consanguinity, natural affection and mutual interest. How instinct, reason, love, and all the natural forces of man, are thus securely bound to work together for the common weal.

"Since the State is the outgrowth of the family, and exercises its original defensive powers, the family is thereby entitled to protection in all rights essential to its integrity and prosperity. Some of these rights, such as marriage and parenthood, are not created by legislation. They exist prior to and independent of human enactment. The State is bound to give form, recognition and protection to these rights. Questions so grave, urgent, far-reaching and profound, involving ethics, anthropology and psychology, the entire history and science of man, should receive the most studied consideration of political philosophers and experienced jurists.

"Assuming to maintain all these rights of the family, the State must be held to a strict account for the discharge of its obligations. Necessary precautions must be taken, in establishing the society of the family, to secure deliberation, freedom of choice, and mutual protection and regard. Wise Christian laws must be devised, recognizing marriage as a *union* and not a voidable contract; for 'The man shall cleave to his wife and the twain become one flesh. What, therefore, God has joined together let not man put asunder.'

"And still, while happily constituted families, consciously or unconsciously, do much to prepare citizens to regard the State as the fatherland, the State, in wisely promoting the universal good by the establishment of free schools, in ministering to the alley and byway as well as the avenue and boulevard, has her chief promise of increasing prosperity and perpetual security.

"The period prescribed by the State for the attendance at school, between the ages of five and eighteen, is wisely chosen. It is the period freighted with peril, brightest in promise, decisive in result. Not too early to rescue thousands of young children from close rooms,

filthy streets, or cruel neglect, and place them in charge of the trained nurses of the State; not too early to begin systematic instruction with youth from homes of plenty; nor is it too prolonged to give the decisive bent which leads to usefulness and fortune. The curriculum adopted should be of such a character and scope as to fully satisfy the needs of this entire period, and awaken the desire for continued improvement.

"The worst impending evil arises from unduly taxing the growing frame with competitive mental effort, while its nervous force is needed to supply its natural wants, thus creating a distaste for all labor and blighting every flower of hope. Another inflicted evil, unwise and cruel, and injurious beyond expression, destructive of self-respect and brutalizing, is the commission of corporal punishment on young children. Happily, this relic of barbarism is no longer permitted in the schools of New Jersey. Many of the schools, however, suffer from insubordination; and many excellent instructors, not apt to govern, earnestly seek a substitute.

"Now I am prepared to say, with perfect assurance, that a suitable system of gymnastics, properly used in the schools, will almost wholly remove these two great evils. Its disciplinary effects on the pupil correspond to those of the soldier on the recruit. Nothing else is so effective in fixing habits of attention and obedience. The results of its use, even in institutions for the feeble-minded, are well nigh miraculous. Should not a practical knowledge of physical training be made an essential requisite for the graduates of the State Normal School and the public teachers? Do not the sanitary, material and military interests of New Jersey, imperatively demand the introduction of gymnastics in all schools and corrective institutions that are sustained, wholly or in part, by the State."

The articles of J. A. Adams, C. E., on "Disposal of Sewage in Cities," and of Professor Charles McMillan, on "Disposal of Sewage in Inland Towns and Places," both of which have since been published, elicited an important discussion as to the relative claims of large or general sewers and the smaller sewers which exclude storm-water. The opinion of most seem to conform to that of Mr. Adams, that the question was one of local adaptability, to be determined by soil, by natural drainage, by surface declivity and by the relations to adjacent water-courses. The discussion on the paper of Professor McMillan turned chiefly on the question of how far a stream could be relied upon as a neutralizer, dilutant or purifier of sewage. While the paper sought to give an approximate formula of calculation, Professor Leeds gave his experience with the Passaic river, and especially with the Brandywine, at Wilmington. At Coatesville, higher up, the water was found much polluted on account of certain factories there, but the

water just above Wilmington, before any refuse from the city was added, was found suitable for drinking purposes. Then, again, the water below Wilmington was polluted. Thus we are able to practically trace the process of purification taking place. We are not only to consider the change made by oxidizing processes, but by precipitation, by sunlight over the whole stream, by animal and plant life of all varieties from the great to the minute, and thus to remember that many agencies more than we have yet estimated, are at work in the conservative transformation and resultant purification.

J. C. Bayles, C.E., of Orange, read a letter which exhibited the method of dealing with the sewage of Birmingham, at Saltley.

"The sewage is carried through drains from the city to a farm where the land is irrigated with it, and crops of potatoes, turnips, etc., are raised. The soil is too rank for cereals. The wonderful feature of the farm is the absence of all offensive odor. Lime is used as the deodorizer, and it renders the sewage perfectly inodorous. Large tanks at the farm receive the sewage, and the overflow of the tanks is conducted through the farm by means of drains. There are 275 acres in the farm. It does not pay the expenses of keeping it, of course, as nearly 100 hands are employed, but it is cheap when the advantages to the city are considered."

Mr. Adams stated some facts as to it, and said the sludge was so unsalable that very much of it had to be buried at heavy expense.

Professor A. R. Leeds made a report as to the adulteration of foods. He showed a series of experiments as to infant foods. The facts as to these have since appeared in the State report.

The relative value of different forms of vaccine lymph, and the needs of revaccination, were ably presented by Dr. E. L. B. Godfrey, of Camden, and Dr. D. Warman, of Trenton. Dr. Godfrey first considers the objections urged against the Jenner or humanized lymph.

The paper next considered animal lymph and the three discussed methods of its propagation, viz., variolation of kine, retro-vaccination, and inoculation from original spontaneous cow-pox. The history of each of these was given, and the reasons why at present variolation of kine and retro-vaccination are not feasible sources of supply. The methods of inoculation from original cow-pox are then described, as well as the embarrassments connected with the present trade methods of supply. The conclusions arrived at by the author are thus stated :

"From a knowledge of the cultivation of bovine lymph, and from an experience in its employment for vaccination, two points, in conclusion, suggest themselves:

"Firstly. That lymph should be procured directly from propagators of acknowledged skill, intelligence and honesty; not through agents paid from thirty to sixty per cent. for its disposal.

"Secondly. That this Association should recommend legislation that would enable the State Board of Health to cultivate bovine lymph for gratuitous distribution.

"In our generation, when vaccination has curtailed small-pox to an almost incomputable degree, but a faint conception can be formed of its ravages in former times. From the middle of the sixth until the announcement of principle of vaccination, near the close of the eighteenth century, the most destructive epidemics of small-pox prevailed in every quarter of the civilized globe. Procopius, who flourished in the sixth century, gives the first description of the character of the disease, then raging in epidemic violence in Egypt and Arabia. Bruce, in his 'Travels to Discover the Source of the Nile,' expresses his belief that the abandonment of the siege before Mecca by the Abyssinian army was due to the effects of small-pox among the troops. During the ninth century the disease invaded England, and was carried throughout Europe by the Crusaders. In 1516 it was carried to St. Domingo by the Spaniards, and three years later it entered Mexico, destroying more than three millions of its inhabitants. In 1707 it reached Iceland; extended to Greenland in 1733, and in a short time destroyed one-quarter of the population of those islands. So terrible have been its ravages that, not excepting the black death, which destroyed in the Eastern countries during the fourteenth century more than twenty-four millions of people, or the sweating sickness of the sixteenth century, has this scourge been regarded as the most destructive of all the acute diseases known to man. Not alone for its great fatality, the loathsome condition attending it, or the disfiguration of those who escape it dangers, but for the demoralization it engenders, as seen in the prostration of business, the desertion of friends, and the abandonment of homes, has it been regarded by Macaulay as 'the most terrible of all the ministers of death.' When it is remembered that, in the century preceding the discovery of vaccination, forty-five millions of people died from the effects of small-pox; that more than two hundred thousand, according to Dr. Lettison, fell annual victims to it on the Continent of Europe; that two millions perished in the Russian Empire in a single year; that the yearly mortality in England was forty-five thousand, forty times greater than it is at this time, in proportion to the increase of population; that an epidemic existed in London for more than ninety continuous years; that cities have been desolated, villages abandoned, and armies disbanded, some estimate can be formed of the transcendent importance of the discovery of the principle of vaccination."

The paper of Dr. Warman confines itself chiefly to an exhaustive discussion of the ground on which animal lymph (not humanized) is to be preferred. He thus states some of the advantages of bovine lymph:

"Relying upon the statistical information which has been presented, showing the infrequency and small mortality of variola, in the early history of vaccination, that is, in the days when humanized lymph had undergone but few transmissions from the natural disease in the cow, the conclusion would seem to be fully warranted that frequently renewed bovine virus would afford an equal protection in our day. M. Warlomont (*Br. Med. Jour.* 1881) strongly reiterates the assertion made by him as to this matter some years ago. He states that out of more than 10,000 children vaccinated at Brussels with animal vaccine from 1869–70, not one case has to his knowledge been reported as having been attacked by the terrible epidemic that ravaged Europe soon after. He has made a number of appeals for information as to cases of variola, after animal vaccination, but so far without result. Others have made similar requests, and have offered large rewards for such information, but without avail.

"It has been repeatedly urged by some that bovine virus 'does not take well.' Without any reference to individual success, which of course depends altogether upon personal skill and experience, we have recently been put in possession of certain statistics which show that in experienced hands animal vaccination gives, to say the least, as good a percentage of successes as can be exhibited by vaccination done with ordinary current lymph by equally skilled vaccinators. Dr. Warlomont writes that when calf lymph is inoculated direct, taken from pustules at the proper age, no other failures are known but those resulting from the manipulations of the operator. Out of 300 children thus vaccinated by himself, not one puncture failed to produce a good pustule. When preserved vaccine was used in primary vaccination, the successes were at the rate of ninety-six per cent., and in revaccinations at the rate of sixty-two per cent.

"Ernest Hart (*Med. Times and Gazette*), in a recent address on animal vaccination, presents some further statistics which were supplied him by Dr. Carstan, of The Hague, as follows: In 1869, when animal vaccination was begun in Rotterdam, there were sixty-seven failures out of 542 operations; last year, 1880, there were only four failures in 2,727 operations, whilst in 1,563 of these the full amount of ten vesicles was obtained.

"At Amsterdam, there were nineteen failures in 1879, when animal vaccination was started, out of 626 operations; whilst during the last six years there has been but one single failure, out of a total of 14,849 operations. Similar experience comes from The Hague, Utrecht and Haarlem; and the gross total of all the vaccinations performed in Holland with animal lymph, including all the early efforts, shows

that out of 60,754 operations, only 720, or little more than one per cent., have been unsuccessful. Testimony such as this, says Mr. Hart, and on so large a scale, shows indisputably that the allegations made against the taking power of calf lymph have no foundation in fact.

"The conclusion of the whole matter, therefore, from all the testimony that we have been able to gather, establishes the following facts:

"1. That both humanized and bovine virus are good, but that, in point of protective power, bovine lymph is superior to humanized virus.

"2. That humanized lymph, but few removes from its bovine origin, as in the days of Jenner, is but slightly, if at all, inferior in protective power to the bovine; but that continually transmitting it through the human system is a cause of gradual and certain deterioration.

"The bovine lymph is preferred again for the simple reason that with humanized virus certain dreaded diseases may be communicated with vaccination, although the danger is no doubt greatly exaggerated. However, the public is entitled to the benefit of the doubt. Besides, the production of bovine lymph can be carried on in a much more regular way, affording a constant unlimited supply, as needed. And finally, we desire to emphasize and impress upon your minds that all these superior merits which we claim for bovine virus, apply only to a pure and genuine virus. It is a well-known fact that the business of producing the bovine lymph in this country has been undertaken and carried on by persons of neither skill nor knowledge of the subject, and much spurious virus has been sent broadcast over the land. The cultivation of bovine lymph may be considered a skilled pursuit, and a liberal amount of training, experience and knowledge should be required of those who engage in it. The propagation of animal virus, of perfect quality, is of such momentous importance to the public, that it should not be left solely to private enterprise or business cupidity, nor degraded to the level of a commercial trade, but should be under the control of the national or State government, so that lymph of undoubted good quality could be always obtained."

A paper was presented by the Rev. F. R. Brace, Superintendent of Schools for Camden county, as chairman of the committee, as to "What is Feasible as to Method and Law for the Protection of Schools from Uncleanliness and Contagious Diseases?" The paper has important suggestions, and so is published with this report.

Professor H. B. Pierce, city Superintendent of Schools for New Brunswick, as a member of the committee, made an unwritten address on the same subject.

He opposed general recesses at school, on the ground of dangers to the children, moral and physical, but said that the pupils should be allowed individual recesses. In place of general recess, he suggested

calisthenic exercises, during which the air of the school room may be entirely changed. He advocated yearly sessions of nine months, and the teaching of physiology and hygiene in their elementary forms.

In conclusion, he offered the following:

Resolved, That the State Board of Health be requested to have printed slips, containing the names of dangerous diseases, which are considered contagious, distributed among the city and county Superintendents of Schools.

That physicians be requested to notify either the Superintendent or Principal, whenever a contagious disease is found in a family, of whose members one or more attend school.

That when such notice is received, the teacher be authorized to suspend all pupils from such family until the attending physician certifies that all danger from contagion has passed.

That the State Board of Health be requested to obtain the passage of a law forbidding the holding of public funerals in all cases where death was caused by a contagious disease; also, when public notice of funerals is given, such notice shall name the disease of the deceased.

In order to improve the health of school children, the following was submitted:

Resolved, That the school year begin on the Monday next to the 15th of September, and close on the last Friday in June.

That the morning session commence at 9 o'clock, and close, for primary classes, at 11:15, and for all other classes at 11:30; that the afternoon session commence at 2 o'clock, and close, for primary classes, at 3:45, and for all others at 4.

That no general recess be given, but individual recesses be granted whenever needed.

That calisthenics be required twice in the morning session and once in the afternoon, allowing from three to five minutes for each exercise, and during such time the air of the room be wholly changed.

That the State Board of Education be requested to require of all teachers, as one of the necessary qualifications to obtain a certificate, a knowledge of the elementary principles of physiology and hygiene.

At the ninth annual meeting of the New Jersey Sanitary Association, held at the State House, Trenton, December 6th and 7th, the President, J. C. Bayles, of Orange, presented the annual address, on "Methods of Popularizing Sanitary Information." He showed that people had and felt much interest in the subject, yet, because they depended mostly on newspaper items, they were often misled. Half-knowledge can do a great deal of harm. He urged the importance of information for

the people from authorities, and of the distribution of sanitary leaflets, and instanced the effective service of some of the State Boards. The value of local Sanitary Associations was also urged and illustrated.

J. J. R. Croes, C.E., presented a paper on "The Methods of Sewage Disposal Without Discharge into Streams."

He alluded to the fact that sewage-water contained organic matter, both in suspension and solution. The solids, in ordinary town sewage, comprise from 70 to 200 parts in 100,000 by weight, averaging about one-eighth of one per cent. of the whole volume, which is equivalent to 128 parts in 100,000. Of these 128 parts, 82 parts are held in solution, and 46, or only one twenty-second of one per cent., are in suspension. This, although small, is very troublesome, since the parts are finely comminuted and settle slowly, and, when precipitated, form a slimy and offensive mass, ninety per cent. of the bulk of which is water, and which can neither be pumped nor shoveled by ordinary processes. This is known as sludge. The eighty-two parts of impurities in solution need also to be diminished. Ordinary sewage contains 10 times as much organic carbon, 600 times as much ammonia, and 10 times as much chlorine, as is considered admissible in drinking-water. The sludge, which is of little value as a manure, must be separated and disposed of, and the effluent water, which is highly polluted, must be purified. Simple subsidence of the solids is slow, and produces offensive odors. The addition of some chemicals hastens subsidence and retards decomposition. Sulphate of alumina and chloride of iron are the most effective.

For oxidation, which is the chief desideratum, no method has been found as efficient as passing the water intermittently through porous soil. To effect disposal of the particles, so that every one can be brought into contact with the air, the most effective method is to "saturate, with the fluid, the upper stratum of a bed of porous earth, and then dry it by absorbing part of the fluids by the thirsty roots of plants and letting the rest drain through the soil, into which, as the fluids disappear, fresh air enters from above and furnishes a fresh supply of oxygen to repeat the operation when the time has arrived for another supply of filth-laden fluid to be poured into the soil." As the matter in suspension can first be removed in the shape of sludge, and as this tends to clog the trenches and to impede the circulation of air, the author contends that, in many cases, the sewage should first be clarified by the precipitation or removal of the grosser or suspended material, and then the principle of intermittent filtration be applied.

He believes that all that is needed is for chemists and mechanical inventors to grapple with the problem of clarification. In the plan of precipitation and running off into vats for evaporation, there is too much offensive odor. In others it is drawn off into canvas bags, which are subjected to hydraulic pressure and the moisture thus squeezed out. A process which promises good results, is that of filtration of the sewage, after the addition of the precipitant, by a mechanical filter, in which sawdust is used as the filtering material, and the surface of the material removed by a revolving cutter as it becomes clogged. The combined sawdust and sludge is readily compressed into cakes. This may be burned under the boilers which furnish steam-power to operate the works. The idea of profit must be secondary to that of health. In a number of English towns, the expense of preparation of the ground for intermittent filtration, including the settling tanks and all the pipes, averages $400 to $500 per acre. Preparing the land for *sub-surface irrigation* would probably cost $2,000 per acre. The annual cost of maintenance of sewage-disposal works, in several English towns, averages twenty-five cents per head of the population. Where sewage is to be purified, it is desirable that its volume should be as small as possible, and it is not advisable that any more rain-water, or drainage-water from the soil, should be delivered at the disposal works than is absolutely necessary.

C. F. Wingate, C.E., Prof. C. F. McMillan, E. M. Hunt, M.D., and others took part in the discussion.

Mr. Wingate urged the importance of a due consideration of all such methods of sewage disposal as will be necessary to such towns as cannot or ought not to dispose of their sewage into streams.

Prof. McMillan thought that Mr. Croes had overlooked that much land would not permit drainage six feet in depth with proper outfall, and so could not be prepared for soil absorption or distribution so as to permit the sewage of 1,000 persons to have intermittent filtration on one acre. He alluded to the successful dealing with an uninviting piece of ground at Princeton by means of the small pipe system. The value of all small pipe and of deep drainage was urged on the ground that these serve as air-tubes through the ground, directly, as well as by being water carriers, and relieving the soil from its water and so admitting more air.

Dr. Hunt suggested that the arguments for sewage disposal, other than into streams, must be based on considerations of locality, economy, etc., in all cases, since it could not be admitted that many

rivers may not in distances of a few miles dispose of fresh sewage. He drew attention to the fact that uncropped soil, in itself, had no great oxidizing value, but that those who advocated ground disposal concentrated their chief plans on securing the presence of air in the soil. If so, and if this is, after all, the great agent, air can reach sewage in the great open and in uncovered streams and rivers and amid the flow of currents, and over rocks and stones amid light and wind and wave as well as in most ground.

T. W. Harvey, M.D., of Orange, presented an elaborate paper, in which the following contention was supported:

I. That malaria chiefly occurs as a result of heat, moisture and vegetable decay.

II. That it is probable that there is a germ entity, the development or sedation of which, amid fertilizing and proliferating conditions, gives rise to malaria.

III. That, oftener than we have thought, malarial diseases result from drinking water charged with vegetative life, or the specific products of decomposition.

Dr. Harvey supported this view by some opinions of others and by interesting cases of his own, in which the use of particular wells or waters had caused malaria in neighborhoods or under circumstances where those not using them escaped.

Dr. Hunt, by direction, opened the discussion. After alluding to the recent tendencies to limit or deny the paludal origin of malaria, he showed how, while admitting a biological factor, it was still in full evidence that abnormal conditions of vegetable decay and neglect of proper drainage were the occasions of the disease. It was also pointed out that not only were marshes, etc., the habitats, but that these differed, and that individuals also differ as hosts for malaria. Some of these differences were noted. Those localities and those individuals which are best made to conform to known laws of prevention are the most successful in preventing malaria.

Dr. Benjamin, of Camden, gave great prominence to the germ view of malaria, and showed how it, and it alone, would account for the natural history of the disease.

H. P. Godfrey, M.D., of Camden, read a valuable paper on the explanation which the germ theory affords as to the origin, cause, conduct and prevalence of the specific diseases. He illustrated how, in one disease after another, the phenomena of occurrences were thus explicable.

J. W. Pinkham, M.D., of Montclair, read a paper on "Domestic Wells and Cisterns, and the Best Method of Construction." After an analysis of the sources of water, and objections to water as obtained from shallow wells, the author claimed that the open well must go, and that there is more safety either in driven wells or in such as are arched and concreted to at least six feet below the surface. Dr. Pinkham alluded to the error of view induced in digging wells by the apparent running in of rivulets from one or more special directions. While it is true that the stratification or looseness of soil may determine some of these, it is also true, practically, that a well is the drainage-tube of a general area of ground surrounding it, and, as such, must represent to no small extent the organic and some of the inorganic material contained in the vicinity. The use of cistern-water was also advocated, it being shown how cisterns could be protected from leaves and settling on roofs by screens, and how a brick septum would serve as a filterer.

George P. Olcott, of Orange, indorsed the views as to the feasibility of cisterns, and showed how the outside finish of ground cisterns and proper puddling or cementing are important. For the sake of cheapness, many cisterns are very carelessly built. Warning was given, both in the paper and discussion, against the building of cesspools where they might get access to wells.

Prof. A. R. Leeds treated of "The Agencies, both Natural and Artificial, Affecting the Purity of the Passaic River Above and Below Paterson." After giving various facts as to the water of this river, and after statements as to various other rivers and localities in comparison, he spoke as follows:

"It should be distinctly stated that there is no foundation in fact for the oft-repeated statement that water once polluted by sewerage can never again become safe for drinking purposes. If this statement were true, it would exclude the water of London, and of very many towns in Europe, and with the exception of Brooklyn, Rochester, and a few other cities, most of the large towns of the United States, from the number of cities having safe water-supplies. There is a *vis medicatrix* in the general operations of nature as well as in the human system, and no one whose attention has not been particularly turned to this subject, would adequately realize the resistless energy with which nature, when we do not interfere with her operations, as we do in noxious grave-yards, oxidizes and soon gets rid of every particle of effete organic mattter. But when this effete organic matter is placed under conditions most favorable to chemical change, as it is when dis-

solved in an extremely dilute condition through a vast volume of water; when it is directly acted upon by the oxygen in contact with the surface of flowing water, or artificially mingled with the air in tumbling over rocks and falls; when the oxidizing action thus produced is aided by the oxygen dissolved in the water and that which is liberated by the pores of aquatic plants, then this destruction is much accelerated. But this is not all. Light itself is a most powerful aid in increasing the rapidity of oxidation and in effecting these decompositions. Until the discovery of chlorine and bleaching powder, light was the only agency used to bring about an oxidation of the coloring matters in cotton and woolen goods, and thereby bleaching them. The same oxidizing action is taking place, aided by the chemical energy of sunlight, in the case of the matters dissolved in water, with the difference that the nitrogenous organic matter, which is the most objectionable part of this organic matter, is far more prone to decomposition and far easier of oxidation than the comparatively stable bodies which form the natural or artificial coloring matters of cotton and woolen goods.

"In the third place, aquatic plants and living organisms of unnumbered variety play a great part in altering, decomposing and assimilating organic and even mineral constituents in the water. Finally, clay and earth have an energetic attraction for ammoniacal compounds and nitrogenized organic substances. Every rain which washes into a stream finely divided earth, has a powerful influence in purifying and sweetening the water, because this mud in its precipitation carries down with it a large amount of organic material which it has removed from solution. The action is analogous to that of charcoal, which absorbs the noxious gases of water, and is able to remove from solution the strongest tinctorial substances, such as indigo. Indeed, the use of clay to remove sewage from water has been recognized in many patent processes of sewage precipitation. But what man does on a small scale and in a very crude manner, is done on a great scale and most perfectly by nature. The fact that lands periodically overflowed by river-water are so fertile, like the banks of the Nile, which have never lost their fertility, though longer cultivated perhaps than any part of the earth's surface, is due to the organic matter carried down by the finely divided mud, and not merely to ordinary organic matter, it should be remembered, but to ammoniacal and nitrogenized organic matter, such matter as is very easy to decay on the one hand, and very easily assimilated as nourishment by growing plants on the other.

"I hold, therefore, that the statement so frequently made, that water once polluted by sewage cannot again become safe for drinking purposes after flowing any number of miles, is contrary to our common experience and observation. Furthermore, that the statement ignores the operation of natural agencies, the reality and efficacy of which are readily apparent. Finally, that wherever the pollution and subsequent self-purification of a flowing stream has been patiently

investigated, the chemical testimony as to the reality of this self-purification has been convincingly demonstrated.

"It is due to this process of self-purification, as I believe, that of the sewage of Paterson and Passaic a certain residue only remains at Avondale bridge. But each year this process is less adequate to deal with the increment of pollution, and each year the perils attendant upon the influx of sewage from above increased. The following is a recent analysis:

"PARTS PER 100,000.

	Newark Intake.	Jersey City Intake.
Free Ammonia	0.0065	0.045
Albuminoid Ammonia	0.027	0.03
Nitrous Acid	0.008	0.008
Nitric Acid	0.37	0.39
Chlorine	2.85	9.70
Oxygen required to oxidize organic matters	0.46	0.49
(Same) as determined by reduction of silver	0.25	0.27
Total Solids	12.50	27.50
Dissolved oxygen per liter	3.65	4.01

"The meaning of these figures is that the Newark sewage must be kept out of the Passaic, or the Passaic must be abandoned by both Newark and Jersey City as a source of water-supply. The grand jury of Hudson county has accordingly presented the mayor and corporation of Newark, for maintaining in the present sewage system of Newark a nuisance, and it is upon the issue of this procedure that the future history of the water-supply depends."

In the discussion, allusion was made to the fact that *in very large or deep reservoirs* the lower water sometimes seems to become dead. It was suggested that there was interference with the vitality of the lower forms of bacterial life which were believed to conserve the purity of water. Not infrequently reservoir-water is not up to the quality of that in the river or source from which it comes. If so, even the water in stand-pipes need occasional comparison with that of the source. Pipes also vary in their supply. Professor Cook stated that just now two pipes in New Brunswick showed difference in supply which as yet was not accounted for. Changes that may occur in the inner surface of pipes must be studied. Sometimes these changes are such as impart taste or smell without any serious results. But we must seek to know the cause in order to determine whether it is casual and harmless or dangerous.

The subject of school hygiene was presented in papers by Professor H. B. Pierce, of New Brunswick; James Green, of Long Branch, and J. Madison Watson, of Elizabeth. Professor Pierce had been appointed the chairman of a committee with reference to resolutions

relating to school hygiene, which had been presented the former year. Already these resolutions had resulted in some valuable leaflets from the State Board of Health. Professor Pierce still urged the importance of compulsory ordinances as to contagious diseases, and for the prohibition of public funerals where there had been deaths from contagious disease; also that in all communicable diseases the notice should name the disease, so that those not wishing to attend, and especially children, might avoid exposure. While the value of these suggestions was recognized, Dr. Hunt, Dr. Newton and others expressed doubt as to the feasibility of including all these in compulsory legislation. Already the law gives authority to local Boards of Health, where they deem it necessary to the public health, to interdict public funerals and to require the notification of contagious disease. To compel local Boards to do this should not be the work of State legislation, unless in emergencies where the evil was spreading beyond localities and jeopardizing the State.

Professor Pierce again urged examination of teachers in the elementary principles of physiology and hygiene. The evils arising from long recesses and the advantages from calisthenics in the school room, and reliance upon very short recesses or individual permission, was again urged. The Association showed much interest in the views expressed and appointed a large Committee of Conference, with power to act by way of recommendation to the Legislature or to School Boards.

The substance of Principal Green's paper will appear in this report. That of Professor J. Madison Watson will be in the ninth volume of the American Public Health Association.

Professor C. F. Brackett, of Princeton, explained such appliances for the raising and distribution of water as are of more recent application. In Manchester, N. H., the source of supply has been made to furnish the power by water-wheels and pumps much above the source. By another contrivance, a bucket, automatically filled, is made to work a pump-plunger in connection with a counter-weight so as to supply water from a small stream to a number of houses. Solar heat has been applied so as to work an engine and pump, and raise water from driven wells. By the use of electricity as a transmitter of power over long distances, the sewage of a city situated in a valley entirely surrounded by hills, may be made to run dynamos, drive water-wheels and so transfer power to a pumping station as to raise sewage or water over ascents where drainage and tunneling would be impracticable.

In that distribution, which needs to take place after water has become the vehicle of organic matter in suspension or solution, as in the ordinary sewer-pipe, he illustrated the advantage of a running stream constantly fed with air at every possible point. Air tends to adhere to surfaces and to water and to mingle with it. If, from the upper segment of the pipe, there go up wherever possible small tubes for admission of air, and if these tubes reach down so as to go into the flowing stream, there will be a constant adherence or drawing in of air which thus mingles with the water and performs its oxidizing and purifying processes with remarkable rapidity.

The subject of filtration was treated by Professor Geo. H. Cook, of New Brunswick. Its contents will be found in this or a subsequent report. These selections from the meetings of this Association thus present an index of the broad field of sanitary science and art, and contain very valuable suggestions for the people of the State. Physicians, engineers, chemists, teachers and the workers in the practical details of mechanics find these conferences of great value and are thus contributing to the social, household and economic welfare of the State.

TRADES AND OCCUPATIONS.

BY EZRA M. HUNT, M.D., SECRETARY.

The relation which an inquiry into trades and occupations has to public health and welfare has been recognized from the first conception and application of sanitary art.

It first became apparent in an inquiry as to poor laws and the effect of friendly societies, because it has so often found that penury or sickness had resulted from the effects of trades or from the conditions under which they were followed.

The first official appointment in England that can be said distinctly to have had its origin from the writings and appeals of sanitarians, was that made in 1832, when Dr. T. Southwood Smith, Mr. Thomas Tooke and Edwin Chadwick were appointed to investigate the question of factory labor.

The prosperity of a country and the welfare of the population are very dependent upon the various trades and occupations and consequently upon the health of the operatives.

There are various reasons why so important a public concern cannot be left to self-regulation. The multitudes of workmen, as well as their employers, are ignorant of some of the necessities of physical life and of the special complications and embarrassments of various occupations. The harm done is often gradual and is not realized until well nigh irremediable.

Most, even, if feeling the embarrassments to which they are exposed, do not know how to ameliorate or avoid them, or, if they do, cannot enforce the provision of and compliance with the needed adjustments.

First of all there is need that there be a better understanding on the part of all of the demands of life and health and the conditions and surroundings which are most favorable thereto.

Next to this is a knowledge of the real evils and how to counteract or correct them.

Each trade and occupation needs to be considered as to its special demands, exposures and liabilities. Circular XL. of this Board, as contained in this report, outlines these. The effect of each department of any given trade needs to be considered. Then comes the general question as to by what methods or devices the evils are to be overcome or reduced to a minimum. There is but little realization in very many trades how much human life is shortened or its powers abridged by the occupation or by the place and circumstances under which it is followed. There are many industries in which the power to make full time and do good work does not extend over twenty years of the artisan's life.

From the elaborate and proximately correct tables of Hirt we have, as averaging, for those under treatment, *of under fifty years of age at death*, for agate-polishers, britannia-workers, cabinet-makers, cement-makers, chimney-sweeps, coppersmiths, cotton operatives, diamond cutters, glass-cutters, goldsmiths, locksmiths, laborers on artificial flowers, arsenical mines, color-works, lead mines, lead smelting, quick-silver, silver smelting, sugar of lead, machinists and stokers on rail-roads, millers, millstone-makers, mirror-makers, needle-polishers, painters, plasterers, porcelain-makers, sandstone workers, stone-cutters, tinkers, varnishers, while various other occupations follow in close degree of briefness of life. It is noticeable especially how large a portion of these are trades in which there is inhalation of irritating dust. It is also to be borne in mind that often these deaths at middle life stand for long years of sickness or of enfeebled and diminished work. Our climate, our methods of work and the use of machinery, make some modification as to trades, in some cases increasing and in others diminishing the evils.

We need to take the facts in evidence as furnished by careful statistics and deductions from foreign sources, and then, by our own close examinations, see how far these are to be accepted. This Board has, from time to time, directed its attention to various industries, in order to acquaint itself with the character of each and the peculiar liabilities which they involve. We now have under systematic observation the effects of pottery, printing, glass making, oil cloth, and flax and jute industry.

The object of this paper is to furnish some facts as to some of these, preliminary to those special observations which are now being made and which will be reported in due time. The interests of the working classes in all these regards must not be overlooked.

PRINTERS AND PRINTING.

Dr. R. S. Tracy, of New York, in his Treatise on Occupations, says: "Printers, including compositors and pressmen, are generally pale and unhealthy in appearance. The characteristic anaemia is largely due to the bad ventilation of the rooms in which they work, to the lack of exercise, and, in the case of pressmen, to the heat of the press-rooms. Compositors frequently suffer from dyspepsia and diarrhœa, and also from bronchial catarrh and phthisis. According to Tardieu, twenty-five in one hundred die of the latter disease. Pneumonia is common among them, and is likely to be severe. The habit of putting type in the mouth, leads to the formation of cracks and fissures of the lips, and small tumors on the inner surface, caused by the obliteration of the mouths of the follicles, which sometimes ulcerate and form painful sores. Lead-poisoning is very rare among them, but there are occasional cases of 'professional cramp.' Pressmen are said to suffer frequently from varices and heart disease."

Printers, from the sedentary character of their work, incline to keep the rooms hot, and being susceptible to draught, breathe much foul air if they are compelled to depend upon open windows for ventilation. Where this is the case, the windows should always be provided with a board piece to put under the lower sash, and so raise it as to let in air between the upper and lower sash, or should have an opening at the top and a hood or device for directing the cold air first upward to the ceiling and thus prevent draught.

Dr. Edward Smith has written a valuable report on the sanitary circumstances of printers in London. (6th Report Medical Officer Privy Council, 1863.)

He divides them into the following classes: Readers; compositors, who are remarkable for quickness and nervous excitability; pressmen, machinemen, and then warehousemen, who are essentially porters. Reading boys and boy machine-tenders are also spoken of.

In newspaper offices, the extra demands made by night work and by irregular hours, need to be given full consideration as increasing the tax and risk to vitality.

The *Reader* is necessarily more educated than the usual workmen and has often both literary and constrained labor to perform. In large establishments he must often be ready at hand with his correction, work rapidly, and at late hours. He is very apt to be put in some

corner closet or confined room, ill-ventilated, subject to draught from the opening and shutting of the door to his den. Many of them have a pale and overworked aspect, which comes from confinement and want of exercise out of door and all over the body. They often have headache, dizziness and eye affections, caused by their close reading and correcting of proof. They should have every advantage of light, warmth, pure air and a comfortable position, and should often change posture while at work. Many are forced into other occupations by the failure of their eye-sight. Careful periodical examination of the eyes by a skilled oculist, would save many of them form permanent disability or embarrassment. In a close observation had of one hundred for ten years, in London, in various leading offices, the average age at death was forty-five, and chest and nervous diseases predominated.

Compositors—These usually work standing, or varying occasionally to a high sitting posture for rest. The distribution of light for them, which should be mostly from above and on the left side, is often defective. We have generally found the rooms in which compositors work, illy-ventilated and dirty, because there is no thorough system of room-cleaning. It is of great service if, during meal hours, for a longer or shorter time, the windows are thrown open and the air changed. Tubes similar to the Tobin ventilator, communicating with the outer air and permitting of opening and closing, are often of service. During the time when the gaslights are used, there is less ventilation through the side and other apertures. In such rooms the air is often too moist, as shown by the rills on the inside of the window-panes, and thus the air is more oppressive. Often, by means of staircases, the upper rooms receive both hot and foul air from the lower ones, and so are more unhealthy. When the heating is by hot water or steam-tubes passing around the sides of the room, it is to be remembered that it is the air of the room, and not fresh air introduced from without, that is being heated, and that there is much more heat around the sides than in the center of the room. This is said often to give rise to rheumatism, and, to those who have one leg near the tubes, to the "printers' sore-leg disease."

Dr. Smith, after making many special facts as to health and disease, says: As to compositors, as a rule, I can arrive at no other general conclusion than that they are a "sensitive and not robust race, enjoying life in only a moderate degree, and not peculiarly liable to varied and acute diseases, but with a tendency to defective alimentation and

assimilation, and thence towards exhaustion of body and consumption." Short sight is common, and it is also commonly believed that "the conditions of the employment lead to habits of drinking." New type and case dust are also claimed as injurious—the former because the metal gets into the skin or mouth, and the latter as an irritant to the lungs. It is noticed that many printers keep at work with an amount of disease which would effectually disable a person exposed to the weather or engaged in more laborious occupation.

"Consumption is known universally to be the chief cause of death among printers." "It is about twice as prevalent among them as among the members of the whole community. What may be called stagnant heat, as well as foul air, greatly depresses the vital powers. The whole excess of death-rate over that of the general community is due to the unhealthy conditions in which they are placed, and to causes quite preventable." Both on account of the heat and of the consumption of oxygen caused by the gaslights, it would be a great improvement if electric light, properly shaded, could be introduced for all night work. Each room should have a thermometer.

Pressmen—The occupation of pressmen is more laborious and a more general exercise of the body. It develops most the right side of the body, and inclines to roundness of shoulder and constriction of the chest. The room is generally in one of the lower floors, and often lacks in light and ventilation. As the heat in the press-room is greatest at night, from the perspiration and the handling of the damp paper, there is liability to rheumatism or myalgia in some form.

Machine-Minders and Engineers work mostly in the basement or on the lowest floors, where bad air, dampness and the absence of light are unfavorable to health. We know of no special evils incident to their actual work. The boys who assist and remain long at the work are usually pale and lightly built, and do not grow rapidly. The place, the monotony of the work, long hours of labor and little change of posture are probably accountable for this. These and irregular or restricted sleep tell upon these more than adults. As a rule, a printer's office is a poor place for the growth and physical development of young persons.

The improper location of closets and urinals is found to be a great source of foul air in printing houses, as in many other close industries. Lime washing of all the rooms and painting of the rooms each year,

and a more special housekeeping care is greatly desirable, because the walls, as well as wood-work, become blackened and soiled, and light and color, as well as cleanliness, are important.

POTTERS AND POTTERY.

The diseases of operatives in clay and in pottery have been studied at various times and in different countries from the days of the learned Ramazzini, of Modena, to the present. But occupations and the modes of their pursuit have so changed that we have to confine our studies to those modern times which have to do with the introduction of machinery.

In the supplement of the Registrar-General of 1871, reviewing the statistics of ten previous years, Dr. Farr says: "The earthenware manufacture is one of the unhealthiest trades in the country. At the age of joining it is low; but the mortality after the age of thirty-five approaches double the average; it is excessively high; it exceeds the mortality of publicans (inn-keepers). What can be done to save the men dying so fast in the potteries and engaged in one of our most useful manufactures? Among the glass manufacturers the mortality is highest at twenty-five to thirty-five than among the earthenware manufacturers, but it is lower afterward."

Dr. Parkes, in his "Manual on the Personal Care of Health," laments that, "in the pottery factories where, as in metal trades, there is much dust, very simple plans, such as wearing, in certain operations, canvas masks or respirators, are never thought of," and that men "go carelessly on in the old way, letting ill-health come as if it were inevitable."

The most valuable report on the diseases of potters is that of Dr. Greenhow, made to the Medical Officer of the Privy Council (1860), Great Britain. Although the inquiry had special reference to lung disease, it fairly presents the various exposures which this industry involves. The observations were chiefly made in the well-known pottery district of Staffordshire, England.

A very careful census of population and comparison with other industries showed that "this class of operatives suffered a much larger mortality from pulmonary disease in proportion to its number than did others."

In pottery districts where the industry has long existed, the potters are short in stature and sickly in appearance. In Stoke and Wolstan-

ton, this could not be attributed to poor dwellings or length of hours of work. As the female population is largely employed, good authorities have attributed it to poor care of children at home, poor housekeeping and general want of race vitality. There are so many departments in pottery, and so many kinds of work, that they cannot all be considered together.

The *Slip-Makers* are those who attend to the grinding and mixing of the clay, so as to form a dough suitable for handling. This work is often done in damp cellars, and causes rheumatism; the workmen get wet with the clay.

The *Mould-Makers*, who make the moulds upon which the various articles are shaped, use much plaster of Paris. There is much fine dust and, sometimes, excessive heat in the process of drying. Many of the workmen suffer from throat and chest irritation, ending in cough and bronchial expectoration. Cleanliness on the part of the workmen by the use of overclothing, proper ventilation and a thorough cleansing of the shops, so that dust would not be raised in moving about, would aid very much. As this matter of dust is so common a cause of irritation, we may notice it here as connected with many occupations. All devices that diminish the amount of dust are valuable. For this purpose, wet grinding is often resorted to. This is of great service in such industries as admit of its application. Thorough cleansing of the rooms and removal of all fine dust between the hours of work is a great advantage. Next to this, is the arrangement of fans, or some method of removing the dust, both from the person and from the room. Various forms of masks, respirators, etc., have been employed. Some of these are useful, but as most of them impede respiration, they are not acceptable to workmen.

The keeping of the mouth closed and breathing only through the nose, and the occasional cleansing and wetting of the nostrils by a sponge, is of great service. Those who thus manage, and several times a day clean the mouth and throat by cold water, very much diminish the evils of dust inhalation. Thorough washing of hands and face, and change of garments, on which the dust falls, is of much service. The habit of eating in the work room is not a good one.

Flat Pressers are those who roll out the dough to proper thickness and fit it to the mould. The material is wet when used, but the scrapings soon become dry and cover the floor and work benches with

dust. As boys are constantly engaged in carrying the various pieces for drying or baking, there is generally a great deal of this fine dust in the air, even when it is not visible. Proper ventilation and cleanliness are necessary. If the drying places are near, both the moulders and the boys suffer from the temperature. As much of the work is piece-work, and many employ their own assistants, evil sometimes comes from irregular haste.

Dish-Makers are less exposed to heat and dust than saucer and plate-makers, because the process is slower. *China flat pressers* are less exposed to heat, but a little more to dust. *Saucer and plate-makers* create much dust in giving an edge to the saucers after they have been dried in the stove. Intermittent currents of hot air strike the worker, and this, with the dust, is one of the causes of potters' asthma.

Hollow-ware Pressers are exposed to much of the same influences as the flat pressers. Both these and the hollow-ware pressers have their full share of dust, and somewhat constrained positions. The sameness of posture and motion needed, both by its constriction and routine, is wearing upon many of the constant workers in pottery.

Throwers suffer chiefly from their constrained position, and, if young, from the weight of the mass.

Turners, who turn into a complete form the ware formed by the throwers, are considerably exposed to dust, but not much to heat.

The *Sagger-Makers*, who make the saggers, which are to hold the ware to be placed in ovens, both in their forming and in their placing-in and removal from hot ovens, have both dust and extremes of temperature.

The *Placers or Oven-men*, who pack the ware in the saggers and afterward place it in the ovens, use sand or flint-powder, and are much exposed. The ware is drawn when the heat is very great.

Scourers are those who remove dust, sand and blisters from the work after baking. They are much in dust. Where there is flint-dust it is all the more penetrating. Biscuit scouring being a most hurtful operation, needs special provision. All these are directly in dust below their nostrils.

Handlers, who make or put on the handles to jugs, cups, etc., are

liable to suffer from heat and dust. Those who carry the ware have frequent changes of temperature.

Decorators, or those who engrave, print or paint, are often in close rooms, in constrained positions, and sometimes overheated by reason of the nearness of ovens or fires in which the work is dried.

Dippers, who dip the work into a liquid glaze, containing lead, previous to its final baking, are said to occasionally show the blue line and other signs of poisoning.

China Scourers respire the most irritating flint-dust, and seldom can work more than five years. All become asthmatical sooner or later. Other pottery workers, as in other harmful occupations, appear to resist the deleterious influence of their calling for some years and then break-down at middle age. Some form of flint is used in most ware, and its sharpness and hardness make it especially irritating to the lungs.

The only alleged effluvium nuisance connected with pottery which is recognized as affecting health, is that resulting from the process of firing. Ballard, in Part III. of his valuable papers on "Effluvium Nuisances," eighth annual report of the Local Government Board, 1878–79, (medical supplement,) includes this among his investigations:

"After being dried, articles of earthenware are subjected to their first firing in what is termed a 'biscuit oven.' When the ware leaves this oven it is in a hard but porous condition, termed 'biscuit.' It is on this ware that any pattern it is to receive is laid on. The pattern is printed with oil upon thin paper, and, being laid smoothly upon the ware, it is absorbed by the porous surface. The paper is now rubbed off and the ware dipped in its appropriate glaze, and when dry is fired in what is termed the 'glost oven.' The articles to be fired are first carefully packed in oval coarse boxes or deep trays, made of strong fire clay, and termed 'saggers,' which are piled one on the top of another in these ovens. After dipping in the glaze it is cleaned by rubbing, and in this process much dust arises. This glaze is made of lead, zinc, hydrochloric acid, clay, etc., which is chiefly injurious by reason of the lead it contains.

"Salt-glazed ware is fired sometimes in open kilns. 'The workman judges from the aspect of the contents of the kiln when it is in a proper condition for salting, and then salt is thrown in with a shovel,' at several points. An abundance of white fume escapes during the salting process, for about twenty minutes after each salting, and passes

off by the chimney. It is the smoke that, in ordinary pottery-making, (earthen-ware, china, parian-ware, etc.,) occasions nuisance. The stacks are not high and much of the smoke reaches the ground. The enamel ovens have still lower chimneys. This fouls the skin and clothing, is not good for the breathing apparatus, and, although not directly causing disease, is not favorable to good health."

The result is not so serious here, as soft coal is not generally used.

The smoke from salt glaze has a more special effect. It is acid and irritating to the organs of respiration, especially those of persons who are suffering from pulmonary affections. It is said to produce in such persons a sense of oppression at the chest, bronchial irritation and cough. The fume consists in a great part of salt, but it also contains hydrochloric acid. It is practicable to reduce very greatly any nuisance from pottery ovens and kilns, as has been done in many places in England. Both in the interests of workmen and of the people of pottery towns, there is need that wherever this becomes a nuisance it should receive sanitary attention.

All the facts as to the perils of this industry point to impalpable dust, constrained positions and sudden alternations of heat and cold, as the causes of shortened lives and of pulmonary diseases so common as to have made the "potters' asthma" a designation for a class of chronic ailments which kill many and are life-long to many more. These causes so far admit of removal or amelioration, and are so destructive in their character that the means of proper cleansing, ventilation and heating, the management of dust and the details of method should be closely inquired into. In no department in our State is there more need of close inspection and of such law as will relieve this skillful working class from evils alike destructive of life, of health and of prosperity.

SUMMARY OF REPORTS FROM LOCAL HEALTH BOARDS.

In October of each year a printed schedule of inquiries is sent to each local Board of Health in the State. The schedule of subjects is as follows:

A. Location, population and climate.
B. Geology, topography and contour.
C. Water-supply.
D. Drainage and sewerage.
E. Streets and public grounds.
F. Houses and their tenancy.
G. Modes of lighting.
H. Refuse and excreta (how managed).
I. Markets.
J. Diseases of animals.
K. Slaughter houses and abattoirs.
L. Manufactories and trades.
M. Schools and school and other public buildings.
N. Almshouse hospitals and other charities.
O. Police and prisons.
P. Fire guards.
Q. Cemeteries and burial.
R. Public-health laws and regulations.
S. Registration and vital statistics.
T. Quarantine, or care over *contagious* diseases and vaccination.
U. Sanitary expenses.
V. Heat and ventilation for dwellings.
W. Diseases of the year.

Other subjects may be named under X, Y, Z. The subjects may thus be referred to by the letters.

If the sheet provided is not sufficient, add others, marked with the letters.

In addition, Circular XXXIX., to be found in this report under the heading *Circulars*, with its suggestions and questions, is sent to each Assessor for the Board, and should be now referred to by the reader. It is not necessary to repeat each year these reports, but to select from them such parts as the Board may deem of local or general value for publication. Those from which no abstracts are made often contain information of value to the Board, and such as much aids in correspondence. While some Boards exist only in form, others are very efficient. Sometimes the Assessor or Board Physician shows great diligence in promoting the general health, and in informing

themselves as to local causes of disease, where other members of the Board give it little attention. Like school trustees, such persons are of very great service to the communities in which they dwell. By reading and observation they come to recognize sources of disease, and often, by advice and suggestion, appreciate the health of the community.

No one can carefully read over the summary we here present without seeing the value of such inquiry and observation, and the careful reader will, from it, obtain many hints as to the work which Health Boards can accomplish. We place the report of the Health Board of Paterson out of its regular order, and give it nearly in full, because it is so near to furnishing an outline of what city health administration is or should be. Other examples will be found in the summary of local Boards of smaller precincts, which are doing much to oversee and regulate the local health interests. The yearly reports we now have in hand cover almost every township of the State, and give most valuable information as to all the topics embraced in the schedule of inquiry.

FIRST ANNUAL REPORT OF THE BOARD OF HEALTH OF THE CITY OF PATERSON.

October 1st, 1883

EZRA M. HUNT, M. D., *Secretary State Board of Health*

Organization.—The Board of Health of the city of Paterson was established under the provisions of the State laws relating to the public health, by an ordinance passed by the Board of Aldermen November 13th, 1882. On the same date, the Mayor, David T Gillmor, Esq., nominated Dr. Elias J. Marsh, Dr. John Quin, Mr. Henry L. Butler, and Mr James Beggs, who, with the Health Inspector, the City Physician and the Registrar of Vital Statistics, should constitute the Board of Health. The Board organized on November 18th, 1882, by the election of Dr. E. J Marsh as President, and the adoption of rules for its government Mr. Henry L. Butler was elected Secretary *pro tem.*; subsequently Mr. John J Warren was elected Clerk, as required by the State laws, and Secretary, as required by the city ordinance. Dr. William K. Newton was appointed Health Inspector for three years

Work of Board.—Among the first acts of the Board was the adoption of "An ordinance respecting contagious diseases" This was made necessary by the existing epidemic of small pox. Subsequently an ordinance concerning nuisances, one relating to the food-supply and one concerning tenement houses, were adopted. These ordinances, the result of much study, not only point out and prohibit violations of sanitary laws, but serve the purpose of educating the people in matters pertaining to the health of the city, and, although not perfect, have proved of great value. They will be amended, from time to time, as may seem necessary, and will finally be made into a code.

Meetings.—Regular semi-monthly meetings, to the number of twenty three, have been held during the year, and special meetings were called when necessary Early in the year, the time of the Board was mostly taken up with the management of the

small pox epidemic, the care of the city hospital, public vaccination and like duties. As a brief resume of the year's work will be given further on it need not be referred to here.

Rules of the Board—Meetings.—Regular meetings of the Board of Health shall be held on the second and fourth Tuesdays of each month, at 8 o'clock P. M., unless otherwise ordered.

Quorum.—A majority of the Board shall constitute a quorum for business.

Committees.—The standing committees of the Board shall be four in number; shall consist of three members each, and shall be appointed by the President. The standing committees shall be as follows: Sanitary Committee, Law and Ordinance Committee, Finance Committee, and Conference Committee.

Sanitary Committee.—To the Sanitary Committee shall be referred all subjects of a scientific or medical nature, and it shall supervise the vital statistics and mortality reports.

Finance Committee.—The Finance Committee shall audit all bills and accounts.

Conference Committee.—To the Conference Committee shall be referred all business with the Board of Aldermen.

Law and Ordinance Committee.—To this committee shall be referred all subjects of law and ordinances.

Order of Business.—1. Reading of Minutes; 2. Report of Standing Committees; 3. Report of Special Committees; 4. Reports from City Counsel; 5. Reports from Police Department; 6. Report of Health Inspector; 7. Communications from other sources; 8. Resolutions; 9. Unfinished Business; 10. New Business; 11. Hearings.

Resolutions.—All resolutions shall be submitted in writing.

Hearings.—Any person feeling aggrieved at the official action of the Board or any of its members, or of the Health Inspector, shall be entitled to a hearing before the Board. *Office Hours.*—9 A. M. to 1 P. M., and 2 P. M. to 4 P. M.

Expenditures.—No expense shall be incurred by any member or officer without an order of the Board, but in emergency expenditures may be made to the amount of $25 upon an order signed by the chairman and one member of the Finance Committee.

Reports.—The Health Inspector shall make a report at each meeting, the Registrar of Vital Statistics shall report monthly, or when otherwise required.

Permits.—1. All permits authorized or required by ordinance of this Board shall be given in the name of the Board.

2. The Health Inspector is authorized to grant permits under sections 3, 4, 5 and 8 of the ordinance respecting contagious diseases, and under section 8 of the ordinance concerning the food supply, and under section 17 of the ordinance concerning nuisances; he shall record the name, residence or the place of business of the applicant, and the character of the permit granted; he shall also report to the Board all permits granted or refused.

3. All other permits required by ordinance of the Board shall be issued upon orders from the Board, and shall be countersigned by the Secretary.

4. Applications for permits under sections 1 and 10 of the food ordinance, and under sections 7, 8, 9 and 12 of the nuisance ordinance, shall be made in writing to this Board, and the Health Inspector shall inspect the business, matter or thing for which the permit is sought, and shall report to the Board at the next regular meeting the result of such inspection. All permits provided for in this section shall be issued and signed by the Secretary.

5. The Secretary shall keep a record of all permits granted by him and of all applications in case of refusal, including the name and residence, or place of business, of

each applicant, the date of the application, the business, matter or thing for which the permit is asked, and the action of the Board, if any, thereon, and such facts as may be necessary for a complete record of each application.

6. Permits when granted shall be good until revoked, but any permit may be revoked by the Board for cause.

7. *Cows*.—No more than one cow shall be allowed to be kept on any city lot on which a residence is built, and no cow stable shall be built at a less distance than fifteen feet from any house.

8. *Goats*.—When a permit to keep goats may be granted, it shall be understood that such goats shall be either kept within the premises described in the application or tethered on pasture, and such proviso shall be stated on the permit.

Contagious Diseases, Management.—1. A notice of infectious disease being received, the Health Inspector shall at once visit the house or put himself in communication with the reporting physician, as he may deem necessary; he shall see that the family receives the printed circular of the Board giving necessary instructions regarding the danger of contagion, the method of disinfection, etc. He shall keep observation of the case until its termination.

2. The Secretary shall notify the Board of Education, or the principals of private schools which the sick children may attend.

3. The Registrar of Vital Statistics is required to notify the Health Inspector whenever a certificate of death from scarlet fever or diphtheria is received by him.

4. The Health Inspector may give a permit allowing the children to attend school, after he is satisfied that there is no reasonable danger of carrying the disease; he shall give no such permit, however, in less than thirty days from the beginning of the sickness, unless the case may have been terminated by death or removal of the patient from the house, and in such case he may give a permit as soon as the house shall have been fumigated.

5. A suitable person shall be employed by the Board to take charge of disinfection and fumigation, under orders from the Health Inspector; he shall, when required, visit houses infected with contagious diseases, and instruct the family in the method of disinfection. At the termination of the case he shall disinfect the house or the room infected.

(NOTE.—Exposure of the corpse or public funeral is forbidden by ordinance.)

Expenditures.—The Board was under great and unusual expense during the months of November, December and January, the city hospital and the various measures necessary for the checking of the small-pox epidemic were a constant but unavoidable drain on the treasury, but the demands were liberally met by the city government. From November 17th, 1882, to the end of the fiscal year, March 20th, 1883, expenditures were made to the amount of $5,153.49.

Appropriation, 1883-84.—An appropriation of $3,500 was placed to the credit of the Board, for expenses during the fiscal year ending March 20th, 1884.

(Although this report is made for the year ending September 30th, 1883, it must be remembered that the time covered by it is but ten and one half months. The work, as previously stated, did not commence till about November 17th, 1882.)

Nuisances.—During the time embraced by this report 529 nuisances have been abated. These nuisances were caused by filthy privies, cesspools, gutters, yards, or some one of the numerous forms of filth. It does not seem necessary to particularize the different varieties, but the aggregate will give an idea of the amount of work done. The following method is employed in the abatement of minor nuisances.

In no case is a report accepted without investigation by the Health Inspector, some

employe of the Board, or a police officer. It was early learned that complaints made by people were, in a large proportion of cases, unreliable, and that the Board was to be used for purposes of revenge, or to aid in a landlord-tenant fight, or to assist in some neighborly contest.

Not ten per cent. of the nuisances abated were discovered by reports made to the Board by tenants or others but house to house inspection by the Inspector or notification by police officers revealed the cause of ill health or annoyance.

An inspection of the premises having been made and the nuisance discovered, a notice is sent to the responsible person requiring him to cause the abatement thereof within a stated time. An exact copy of the notice is kept in the office, together with notes as to when the time expires, etc. At the expiration of the stated time a re-inspection is made. If the nuisance has not been abated a complaint is immediately filed with the Recorder, who issues a warrant for the arrest of the culprit. When brought before the Recorder, the defendant is directed to attend to the order of the Board, or a light penalty is imposed.

In the case of filthy privy-vaults or cesspools, no re-inspection is necessary, for a permit is required before the scavenger can empty a vault; the stub of this permit records the date of abatement and hence checks off the notice sent.

All notices quote the section of the nuisance ordinance that is violated, thus informing the person notified just what is expected of him.

As to complaints, not more than thirty have been filed before the Recorder, and fines not to exceed fifty dollars in all have been imposed. A rigid system of inspection and close watching have enabled us to insure the abatement of nuisances without much litigation. But two trials have been held during the year.

Privies.—Of all the forms of filth which we have to combat, the stored-up filth in privy-vaults is the most annoying and probably one of the most fruitful causes of ill health, and we shall have accomplished a great deal towards making the city healthful when we shall be able to limit, or prohibit, the use of the leaching vault. It has been the custom in Paterson, heretofore, for persons to manage matters of this kind as their ideas of economy or convenience might suggest, and it will take a long time, and compulsion will have to be employed, to remedy this great evil that has existed for the past thirty or forty years.

Of the 7,000 vaults in the city, we venture to say that not more than 500 are water-tight, properly constructed or emptied at frequent intervals. All kinds, sizes and forms are in use, from a hastily-dug hole in the ground to an elaborately-constructed vault, with its walls built up without cement or mortar, with a porous bottom, and all in a more or less filthy condition.

Sections of the nuisance ordinance regulate the building of vaults and require that no vault shall be constructed of any material except brick, shall be at least eight inches thick, shall be water-tight, and shall not be more than six feet deep. It is also provided that the filth shall not be permitted to rise within two feet of the top of the vault. These restrictions have accomplished much good, but we are compelled to acknowledge that we have not yet made the advance we had expected or desired. We feel that we should have increased power to pass ordinances regulating the capacity, the construction, the method of emptying and the frequency of emptying vaults. The nuisance ordinance does not cover the subject, for too much time is consumed in the work of inspecting, and it should be the rule that all vaults should be cleaned at least once each year.

Much of the time of the Inspector has been taken up in his endeavor to abate this great nuisance, and, notwithstanding the fact that 782 vaults have been emptied this

year, there yet remains vast quantities of filth capable of polluting the air and the ground and rendering them hurtful.

To give an idea of the neglect that has prevailed we will state that many vaults had not been cleaned in five, ten and even fifteen years, until ordered emptied by the Board. Without dilating more on this subject, we will state that some rigorous method must be adopted to enforce cleanliness.

Paterson being situated in the center of a rich farming country, it seems necessary that the enormous quantities of organic waste of its 56,000 inhabitants should, to a certain extent, be restored to the land, else the farms be impoverished. Hence, for economic reasons alone, the compost should not all, even if it were possible, be disposed of by water-carriage. At least 18,000 of our population have no sewerage provided for their use, and there must, therefore, be frequent removal in order that a nuisance be not created. This we think possible, if frequent removal be insisted on and made compulsory. Perhaps the city might be induced to take charge of this, as is done with the garbage.

Cesspools.—The number of cesspools in the city is not large. Probably the First and Second wards, where but few sewers are laid, suffer more than the rest of the city from this evil.

The Board, by a vote, discountenanced the building of cesspools, and argued that it was better to allow the slops to flow into the gutters, where it could be washed away either by the rain or flushing, than to encourage the storing up of liquid filth on the premises. Cesspools are placed under the same restrictions as privies, and must be emptied by an odorless excavating apparatus.

Scavenging.—We found scavenging conducted on the usual primitive plan; that is, removal in carts at night, with little or no precautions. An ordinance was adopted requiring the odorless apparatus to be used in all cases where possible, and when that could not be done, tight covered barrels are insisted on. No vault or cesspool may be cleaned without a permit from the Board. This serves as a check on the work, and serves to record the amount of work done. An improvement, which seems important to us, was introduced, that was the granting of permission to do this kind of work by daylight, for the reason that the work would be more thoroughly done and subjected to proper supervision. Not only was permission given to work during the day-time, but it was encouraged, and now nearly all vaults are cleaned between 6 A. M. and 8 P. M.

Cattle.—The evils arising from the herding of a large number of cattle in the built-up portions of the city were soon recognized, and ordinances and rules were adopted leading to the checking of this practice. It was argued that not only was this a serious nuisance, but that the health of the cattle was impaired, and the milk-supply rendered either dangerous or poor in quality.

These facts being taken into consideration, the following sections of an ordinance were adopted:

No person shall keep cattle in the city without a permit, and no person shall keep a greater number of cattle than is stated on a permit. No permit is granted to keep more than one cow to a city lot (2,500 square feet) on which a dwelling-house is built, and no cow shed shall be nearer than fifteen feet to a dwelling.

There was more resistance offered to this action of the Board than to any other measure adopted. Many people had collected cows around their houses for years, and did pretty much as they pleased. It was found, on inspection, that as great a number as seventeen were stabled on a city lot, on which was a dwelling house, sheds and other outhouses. Ten was a frequent number.

The applications for permits were rigidly and carefully scrutinized by the Board, and were only granted after inspection. About 139 permits to keep 361 cows have been granted, and permission to keep 150 head of cattle refused.

Swine.—Only five permits to keep swine have been granted.

Fowls and Goats.—326 permits have been granted to keep fowls or goats, after inspection of the premises, with the proviso in each case that if any nuisance is caused the permit shall be revoked. Permits for goats are only allowed when the applicant promises to keep the animals within an inclosure or tethered on pasture.

Garbage.—The collection of ashes and garbage is made twice each week in the summer, and once a week in the winter, by the city carts. About $8,000 was spent in this work during the year, and a like appropriation has been made for next year.

The garbage and ashes, which are generally mixed, are dumped upon low land and sunken lots within the city limits, large areas of land having been leveled by this method. Part of the land thus made is indicated by red × × × on the accompanying map.

Knowing that land thus made is not fit to be used for building sites—at least for years to come—the Board has strenuously labored to stop the dumping of refuse organic material in the city, and in this it has been partially successful, and now more care is observed in the choice of dumping grounds.

Many methods of remedying this difficulty have been talked over; the separation of the ashes from the garbage by the householder has been advocated, but this will be almost impossible to carry out in the tenement-house districts. Even if separation was carefully done, the disposal of the garbage would still present obstacles to a proper working of the plan. Cremation has been mentioned, and has the indorsement of the Board. This is done in Leeds, Manchester, and other English cities, and no doubt a "destructor" would work well in Paterson. It would probably cost $10,000 for the plant for a city the size of ours.

If each family would burn its own organic waste—which readily can be done daily—the problem would be solved, and the ordinary inorganic refuse of the household could easily be disposed of.

Slaughter houses.—Three applications have been made to the board for permission to maintain slaughter-houses, one permit was granted, one refused, and the other application is now before the Board.

Careful inspection is made in each case, and when there is the least possibility of a nuisance being created, or where there is no proper arrangement for the disposal of blood and offal, the permit is refused.

At present, at least eighty per cent. of the meat-supply comes from Chicago, already dressed, in refrigerator cars, and very little slaughtering is done here. A few beeves, calves and sheep are killed by the local butchers.

The offal from the butchers' stores is collected by one man, and the work is done only in a passable way. The regulation of the trade is now under discussion.

Kerosene.—The sale of illuminating oil has been closely watched. Forty-five samples, collected from all parts of the city, have been examined, and all proved to be of good quality. Much of the oil sold is of the highest grade.

The State law regulating the sale of kerosene has certainly done much good.

Water supply.—Our water-supply is derived from the Passaic river, wells and cisterns. We have endeavored to estimate the proportion of the population using water from each of these sources, but only approximate figures can be given.

From notes furnished the writer by the Superintendent of the Passaic Water Com-

pany—a private corporation, owning the water-works—it appears that about 3,500 takers, or houses, pay for water, many factories and dye works being included in this estimate. As one dye works alone takes water from four 4-inch pipes, it can be seen how futile it is to calculate the amount used per capita.

But we may safely say that about 35,000 people use the Passaic water for domestic purposes, and that about 100 gallons per head per day are consumed. The remainder of the population depend on wells, cisterns being used by a very few people.

As to the quality of the water, from the sanitary standpoint, it can be said that the Passaic water is all that can be desired. This opinion is not rashly formed without good foundation, but it is the opinion of Professor Cook, State Geologist, Professor Leeds and others. The analyses made by Leeds and others show that the organic ingredients indicative of pollution are in very small quantities. In fact, there is no source of pollution above the point at which the water is taken to supply the city except the town of Little Falls. This is a small manufacturing town, about three and one-half miles above us, with no sewer system, and discharging into the river little organic waste and moderate amounts of refuse from dye works.

Between the two places the river runs a tortuous course, and ample opportunity is offered for the oxidation and dilution of any organic matter put into it. For the future, when Little Falls shall increase in size, we cannot speak.

We are now anxiously watching the encroachments of our city on the banks of the river above the pumping station, for contamination from that source is feared. Not a little trouble has been caused already by the slop water flowing down the sloping streets in the western parts of the city into the river, but this has been checked by vigorous measures carried out by the Board.

During the continued hot weather of July and August the water sometimes has a disagreeable odor and taste. This is due to the fact that some of the lower forms of vegetation are killed if the temperature of the water rises above 60° F., and some days it rose as high as 70°; but we are unable to trace any sickness to this trouble.

The water company does its work to the satisfaction of the consumers, and tries to keep up with the demands.

Of the public wells we cannot speak with the same degree of confidence.

At least 15,000 people depend on wells for their drinking water. The Board has prepared a list of the public wells—that is, wells cared for by the city government—and it is found that there are 102; private wells, if added to the list, would no doubt swell the number to four times that given.

The city spends from $1,300 to $1,500 each year in the care of public wells and pumps.

In considering this subject, the large area of the city and the sparsely settled suburbs where the water mains are not laid must be thought of, and due allowance made. But there is no excuse for the existence of wells in parts of the city thickly populated and supplied by the water company.

It is only the obstructive conservatism of many of our people that will explain the adherence to old and polluted wells, and this class resist all interference with the water-supply that they have been satisfied with for the past fifty years.

Constant agitation of the subject, with unimpeachable evidence, will do much towards closing the dangerous or doubtful wells.

The public wells are, as a rule, located under the sidewalks and on a line with the gutter, where every opportunity is offered for the inflow of surface-water and slops, and the filth-sodden condition of the ground in the older parts of the city, the leaky sewers and leaching privy vaults and cesspools offer the best chances for the wells to

become polluted with filth. That there is not more sickness directly traceable to the use of city well-water, can only be explained by the fact that a certain degree of filth contamination seems necessary before a water is made dangerous.

We are watching this subject very closely, and are prepared to close all wells unfit for use. The Health Inspector is now at work, making analyses from time to time, so that we shall know just where to look for pollution.

Food supply—The markets were watched for some time to stop the sale of unsound meat. About 1,500 pounds of immature veal and 2,000 pounds of unsound beef were seized. The work has lagged, however, because of the difficulty of obtaining a competent man to take charge of meat inspection. The system of inspection will be resumed this fall.

Milk.—The milk supply of the city has been so closely watched, for the past three years, by the State Inspector of Milk, that it is now in a very satisfactory condition. The milk law has done much good here.

A book is now kept in the office of the Board, in which the name and residence of the dealers, and the source of milk sold, are recorded. It is our intention to note the result of inspection, the breed and condition of the herd, the feed used and other facts of value. There are about 120 dealers now recorded and the history of each is more or less known. It would be a wise provision if local Boards were empowered to compel the registration of dealers.

Tenements.—The inspection of tenement houses has not been done systematically, cases of flagrant violation of sanitary laws only being noted. According to the United States census of 1880, there were 6,712 dwellings in Paterson. This number has been increased to at least 7,000, for probably 400 new buildings were erected in 1881, 1882 and 1883.

A glance at the accompanying table will give an idea of where Paterson stands respecting the population of each dwelling:

City.	Persons to Each Dwelling.	Dwellings.	Number of Families.
Camden	5.65	8,246	8,772
Philadelphia	5.79	......	......
Newark	7.26	18,786	28,386
Paterson	7.60	6,712	10,679
Jersey City	8.59	14,019	23,957
Hoboken	11.60	2,685	6,717
New York	16.37	......	......

It will be seen that our city stands about midway between Philadelphia, the city of homes, and New York, with its overcrowded tenement houses.

The number of overcrowded houses is small. Two-story dwellings predominate, occupied in many cases by the owner, who rents one floor to a tenant. There are a few tenement houses built on the plan of a great city, with little land to spare, and we regret that the tendency to erect houses on this plan is rapidly becoming popular with landlords. As land in the center of the city increases in value the proportion of high buildings, with but little surrounding ground, will multiply.

There is a vast amount of work for the Board to do in this line of sanitary reform. Our tenement house ordinance is but a feeble attempt at legislation and will be perfected soon.

Sewerage.—The accompanying report of the city officers for the fiscal year ending March 20th, 1883, contains the report of the City Surveyor. By reference to his

report (page 97) it will be seen that 21.67 miles of sewers had been laid prior to that date, since then enough has been laid or contracted for to swell the total to 24.50 miles. The reports also give the sizes, shapes and material of the sewers. I have roughly indicated on the accompanying map, in blue lines, the situation of the principal sewers and the points at which they discharge.

The Broadway sewer, now under contract, will be of great service to the city. It is about one mile long, and the greater part of it runs through either swampy, water-soaked or undrained land. The easterly portion of the city, through which it passes, has been noted for the prevalence of malarial troubles. This has checked the growth of what will, in the future, be a popular section for the better class of homes. We venture to predict that, within two years, the ground will be thoroughly drained by this sewer and rendered salubrious. This opinion is based on our experience with the sewer laid about two years ago in Clay street. The neighborhood through which the latter sewer runs was swampy and water-soaked. To-day the land is comparatively dry, and will be built on in a few years.

The Second ward, with a population of 6,000, has no sewers, and, in the First ward, (population 5,500,) only a few short sewers have been laid. These two wards are in danger of soil pollution from the privy-vaults and cesspools.

The First ward has been mapped, and sewers will be laid as demanded, or as the finances of the city will permit.

The Second ward sewerage system will be a problem hard to work out, for the district is mostly on very high ground and on a line with the river above the pumping station. Hence, careful plans will have to be devised to carry the sewage below the falls.

The sewer system of this city is being very carefully mapped out, and we shall not again make the mistake, as was done years ago, of building them too small to carry off the surface-water. The rainfall in Paterson is enormous at times, and this was not taken into consideration when some of the older sewers were built.

The government desires to build carefully and within its means, without placing too heavy a debt on the city. All our sewers discharge into the Passaic river within the city limits. The river at present, at ordinary flow of water, is capable of taking care of the sewage, but during a drought it is pressed to its limit. An interesting question for the future to decide is how long will the river take up the filth poured into it and when will its saturation point be reached? This vital question we will not here debate, but at some future time it will be taken up for discussion.

House Connections.—As a rule, house connections with sewers are very carelessly made. The work is generally done by laborers, without supervision, and the sole object seems to be to get the job done as quickly as possible, ignoring all ideas of perfect workmanship.

Connections are made by means of six-inch earthenware or cement pipes, and join the main sewer at varying angles.

To give an idea of the lack of care prevalent in this important work, we will mention two cases brought under our notice. In one case, the workman could not find the stub on the sewer, and, being too lazy to get information from the proper person, he started the house drain at the side of the sewer and filled up the trench. The reason why the waste from the house did not run off was discovered six months after the drain was laid. In another case, the laborer encountered a bowlder in the trench, and, for economy, this was not moved, but a piece of the drain was laid on each side of the stone. This was not discovered till months after.

The pipes are put into the trench without system, without alignment, without making joints, in short, in any way to get the job done and the trench filled up.

It is recognized that something should be done, but there appears to be no authority to take charge of the work.

The Board of Aldermen conferred on this Board power to order connections with the public sewer when necessary for the public health. Over 200 have been ordered, but we have no authority to superintend the work or regulate the quality.

Plumbing.—It was well known that the plumbing in the houses, and that being put in, was faulty, or even dangerous to health, and a series of recommendations, embodying the best plans for house-drainage, were adopted by the Board, published in the newspapers, and a copy sent to each plumber. This did a little good, but compulsion seems to be necessary in order to insure good workmanship.

All houses of any pretension now building in the city, and about 250 houses already built, have been inspected by the writer, and he regrets to say that in but one of the new houses were the recommendations followed out, and in all the older houses the plumbing was faulty or dangerous.

It is the opinion of the Board that it should have power to compel the registry of plumbers, to regulate the plumbing construction, to require plans to be submitted to it, and to enforce a system of safe plumbing and drainage. This opinion is indorsed by about twenty plumbers, who need protection from dishonest or unskilled competitors.

Infantile Diarrhœa.—Diarrhœal diseases among the children were very prevalent in August, and twenty children under five years of age died therefrom in that month.

A circular was prepared, giving rules for the management of children during the summer months. 8,000 copies, printed in English and the Holland language, were distributed.

Contagious Diseases.—Rules for the management of cases of contagious diseases, adopted by this Board, are given in a former part of this report.

The general plan pursued with cases of scarlet fever and diphtheria is as follows:

Notice from the attending physician being received, the name, age and address of the patient, and the name of the disease, are entered in a book kept for that purpose. If the patient is a pupil at a school, the principal is immediately communicated with, by means of telephone, and all members of the family, and, in some instances, all children in the house, are kept from school. The Health Inspector then visits the house, or communicates with the attending physician, as may, in his judgment, suffice.

A circular, giving instructions as to the contagious nature of the disease and as to the methods of disinfection, is sent to the house.

Upon recovery of the patient—but never under thirty days—the house is fumigated and a permit given to attend school. In case of death, public funeral is forbidden, and the undertaker is instructed either to place the body in an air-tight coffin or to wrap it in a sheet saturated with a solution of sulphate of zinc, and not thereafter expose it under any circumstances. The house is then disinfected.

This plan has been pretty closely followed out, but we are not yet in a position to state whether or not it has done any good, or checked the spread of these diseases.

The physicians, without exception, are very careful to report cases and deaths, and not a solitary instance of refusal to report can be noted. We have never heard from a physician a complaint as to compulsory notification.

If any case has not been reported, it can be accounted for by lack of care or because it was not seen by any physician; in either event, the board is pretty certain to hear of it from a neighbor, so that we think the record is quite complete.

The writer is of the opinion that not much can be done to prevent the spread of

scarlatina and diphtheria until we treat the cases as we do those of small-pox—that is, isolate, quarantine, or remove to a hospital. This cannot be done here for two reasons—public opinion does not reach that pitch, and we have no properly appointed hospital to which cases can be taken.

Measles.—No attempt is made to manage measles, because we recognize the impossibility of limiting the spread of that extremely contagious disease.

The only restriction placed on these cases is to keep the children in the family out of school until complete recovery.

Cases Reported to the Board.—(The system of notification was first employed on November 26th):

Scarlet Fever.—1882, December, 8 cases; 1883, January, 14 cases; February, 13 cases; March, 19 cases; April, 40 cases; May, 48 cases; June, 26 cases; July, 30 cases; August, 34 cases; September, 45 cases. Total, 277 cases. Deaths, 29.

Diphtheria.—1882, December, 1 case; 1883, January, 7 cases; February, 4 cases; March, 1 case; April, 4 cases; May, 8 cases; June, 0 case; July, 1 case; August, 6 cases; September, 10 cases. Total, 42 cases. Deaths, 5.

Small Pox.—Paterson has had a dire experience with this disease, but so recent is its history that we do not feel called upon to relate it at any length.

Prior to the formation of this Board, November 16th, 1882, there had been 138 cases in the city, extending over the time from July, 1882, to that date.

Coming as it did when the city was unprepared for it, and when the machinery for its management was not complete, it made rapid headway. The people were fully persuaded that the Board of Aldermen was not the proper body to legislate on public health matters, and, yielding to the press of opinion, the Board of Health was formed.

When this Board was organized, measures were immediately taken to rid the city of the epidemic.

The city, when the epidemic burst upon it, had no hospital, save a small building capable of accommodating about eight patients, and, under the press of circumstances, a larger hospital was built. This has been somewhat modified and rebuilt upon plans furnished by this Board, and although it is not what we would have erected, yet it answers its purpose very well.

The hospital buildings are at the extreme northwesterly limit of the city, and are built of wood.

The main hospital building will accommodate comfortably about eighteen patients. Ventilation is provided for by means of sheet-iron tubes surrounding the stove-pipe and passing up through the roof; also by an arrangement fixed on the window sash. We found this to work well.

The city is now better provided with hospital arrangements than ever before, and if money was furnished the hospital could be used for the treatment of other contagious diseases.

The following number of cases of small-pox were noted during 1882 and 1883: Prior to the formation of the Board, 138 cases; November, 1882, 13 cases; December, 1882, 31 cases; January, 1883, 3 cases; sporadic case from Philadelphia, April 15th, 1883, 1 case. Total, 186 cases.

Deaths.—August, 1882, 1; September, 14; October, 11; November, 9; December, 2; January, 1883, 1; April, 1. Total, 39 deaths.

A brief account of the method of managing a case may be of interest:

A notice being received, the Health Inspector immediately visited the house. If the case could safely be isolated in the house, arrangements were made for strict quarantine, and the family were made to understand that it was only by favor that the

patient was allowed to remain in the house and not be taken to the hospital. They were also informed that any breaking of quarantine would be followed by quick punishment. Quarantine at home was only allowed where but one family occupied the house.

Every person in the house, except the sick, was immediately vaccinated. As a rule, two insertions were made, and the people in the neighborhood were offered free vaccination. A placard was placed on the house, warning all not to enter or leave the house except the attending physician and the Health Inspector.

Upon recovery of the patient, he is given a thorough bath and new clothes are put on. The bedding is removed in the ambulance to the hospital grounds and burned; sheets, blankets and underclothing are soaked in a solution of sulphate of zinc; the room and all the clothing are then fumigated by burning sulphur for twenty-four hours.

If it is impossible to isolate the patient at the house, the ambulance is immediately sent for and he is removed to the hospital, together with the bedding. Any clothing left in the house is disinfected with the zinc solution, and the house fumigated with sulphur. All in the house are vaccinated and also persons in the neighborhood, and strict watch is kept of the premises until the period of incubation has passed.

When the patient recovers he is treated as before stated.

In case of death the corpse is wrapped in a sheet soaked in a solution of sulphate of zinc and salt, and buried as soon as possible.

This method worked admirably and no extension of the disease took place from house to house.

Vaccination.—Two reputable physicians were employed, at a salary of $100 a month, to visit every house in the neighborhood of small-pox cases and more than [illegible] were carefully vaccinated and re-inspected at the end of eight days. A complete record has been kept of all vaccinations done under authority of the Board. This record includes name, age, address, whether primary or secondary, how long since vaccinated, the virus used and the result of the vaccination.

Virus Employed.—We used only virus bought from Martin and the New York Health Department, and got excellent results. Much of the success can be accounted for by the care with which the work was done. Ninety-six per cent. of primary vaccinations were successful.

Sporadic Case.—A case occurred in April, in the person of a man from Philadelphia, whose family had but recently come from the small-pox hospital in that city. The origin of this case we never satisfactorily traced, but there are no doubts that there was carelessness in disinfecting the bedding at Philadelphia.

The man had hemorrhagic small pox and died on the second day of the eruption. No second case occurred.

We have thus briefly sketched the rules by which we work, for they have proved of great service.

Vital Statistics.—We regret that the Bureau of Vital Statistics is under the control of the city government, and the books and returns are not available for our use. The Registrar is very obliging, but, as he is not a physician, he is not competent to elaborate the returns so as to be of any benefit to us. We must refer you to the returns sent you by him.

Area of Paterson, 8.36 square miles, 5,357 acres. Area built on, not one-half. Latitude, 40° 55′ N. Longitude, 74° 10′ W. Elevation above sea level at Sandy Hook, (at City Hall,) 87 feet. Population, census of 1880, 51,031. Estimated population, October, 1883, 56,500.

Our relations with the other branches of the city government have been harmonious, and we have received valuable aid from the Police Department.

We have been fortunate in securing for our clerk, ex-Recorder John J. Warren, who, from his large acquaintance with people and places, has been of inestimable value and has aided us greatly.

Recommendations.—We would recommend to your Board that a supplement to the health law be drawn up and introduced in this winter's Legislature, giving local Boards the following powers:

1. To ordain regulations for the construction, location, emptying and maintenance of privy-vaults and cesspools; to require emptying at stated intervals.
2. To ordain regulations for plumbing and drainage and sewer connections, and to require the registration of plumbers.
3. To require registration of milk dealers.
4. To close public wells if water is contaminated.

In closing, we will state that this report has only aimed at giving an outline of the work done. We feel that many of the subjects noted require two or three years more study before an authoritative opinion can be expressed thereon. Hence, the schedule sent by your Board has not been closely followed, but we hope in the future to take up several of the topics and exhaust them.

With this report we send the following: 1. A rough map of the city relating to some matters touched on in this report. 2. Copy of the ordinance of the Board of Aldermen establishing the Board of Health. 3. Copies of ordinances of the Board of Health. 4. Copies of blanks used by the Board. 5. Copies of circulars of information issued. 6. Copy of report of city officers for 1882–83. 7. Copy of report of Board of Education for 1882–83

All of which is respectfully submitted,

WM. K. NEWTON,
For the Board of Health of the City of Paterson.

Paterson, October 11th, 1883.

ATLANTIC COUNTY.

ABSECON TOWNSHIP. - *Report from* E. H. MADDEN, M.D.

No contagious diseases have appeared in town this year, and it has been exceedingly healthy throughout.

The cellars are dry; no water ever appears in them. It is presumable there is no better locality in the State for cellars than in this place.

ATLANTIC CITY. *Report from* JONA. J. COMFORT, M.D., *Secretary.*

Two-thirds in number of the smaller cottages are using cistern-water. A small number rely upon wells. The remainder, including nearly all the larger hotels and cottages, are supplied with potable water, brought from the main-land and distributed through the city in cast-iron pipes. An iron stand-pipe, 132 feet high and 25 feet in diam-

eter, (capacity, 500,000 gallons,) maintains an equable pressure of 60 pounds to the square inch, a pressure available for fire purposes. This water is supplied by a company. It is clear at all times, and soft, being remarkably free from both organic and inorganic matter. Its source is from strong springs, reached by sinking a well thirty feet in diameter and thirty feet deep. This supply, ordinarily ample, can be augmented at any moment by drawing from a neighboring stream of pure water. The water has no taste of iron or other mineral. The pipes are cleansed at proper times.

Atlantic City relies upon surface-drains for surface-drainage, assisted by a few underground conduits. For sewage proper, a complete system of sewers is now under construction, to be built and operated under the West patent. The sewage of the city is to be collected into a large well, and thence pumped to a distance of four miles to a station, where the whole is to be deodorized and filtered, and the filtrate converted into fertilizers. The sewers are to be constructed of glazed terra-cotta pipe, with a fall in no case less than ten feet per mile, with pipes ranging from six inches and upwards in diameter, inside measurement. There is no separate system of drainage for the ground as distinct from sewerage. There are few or no cellars proper, and where there are basements they are not generally lived in. There are salt meadows in the rear of the city, but they are not found to be malarious.

Refuse or garbage is collected from house to house and removed from the city limits by the city, in sealed vessels. During the summer season, this is done daily. Privy-vaults are required, by the Board of Health, to be constructed with sides bricked up and cemented water-tight, the bottom open. They must be emptied each year before the first of May, and oftener when necessary, by the odorless system, and by parties designated in a permit from the Board of Health, and under bonds to perform the work according to their directions. The night-soil is required to be removed beyond the city limits.

There are no cemeteries or burial-grounds in the city limits. Interments are all made upon the main-land.

A Keeper of Vital Statistics has been appointed by the Board of Health from one of their number, and the returns are regularly made and recorded in a book kept for that purpose.

The Board of Health has a hospital for the reception and treatment of severe forms of contagious disease. The milder forms are subjected to domestic quarantine.

EGG HARBOR TOWNSHIP. - *Report from* J. B. SOMERS, M.D.

The water-supply is obtained chiefly from wells, and is mostly of a good quality and in sufficient quantities. The gently undulating character of the surface, and the porous nature of the soil, is adequate to secure, in most cases throughout the township, thorough drainage. I know of no sickness during the past year that has been attributed to this source. Malaria is not our heritage, but rather an importation, largely affecting our sea-going population and modifying the diseases incident to the locality. Where nature has so kindly done her part, no law has been invoked in regard to the drainage question. The township, as yet, has no sanitary map, but it is highly essential that it should have, as an emergency may at any time urgently demand it.

In many cases, slop-water is deposited too near dwellings and wells for good sanitation, and water-closets cleansed only when necessity amounts to compulsion; the nightly accumulations of urine are too often left to stand until the air of the apartments is contaminated with its foulness; probably more ill health arises from these causes than most persons would be willing to admit. In addition, we would say that the garbage, which Atlantic City so generously disposes of, is brought to our doors, and reeks in the compost heaps, or is spread in fields adjoining residences and in villages.

"The offense is rank—it smells to heaven." Beside the annoyance of keeping the whole community in a continual state of nausea, if these are not hot-beds for the generation of all germinal diseases it would be difficult to say where they may be found.

There have been no veterinary diseases during the past year. We have but one slaughter-house in the township, situated in the village of Linwood. It has occasioned no offense.

The local Board has prohibited public funerals in all cases in which the physician's certificate indicates that the death has occurred from small-pox or scarlet fever, and are ready to enlarge the boundaries whenever, in their judgment, the public health is jeopardized.

The law respecting vaccination has been hitherto very generally ignored. Of the 1,038 children enrolled, over 350 have not been vaccinated. The Board has taken measures to notify the chairman of the Board of Trustees in each school district that the law concerning vaccination must at once be complied with.

There have been no especial diseases prevalent during the past year. We have but one public institution in the township—the county almshouse—which is very efficiently managed. During the past year there

has not been a death within its inclosures. I doubt if another such record can be shown since the county was established.

In conclusion, permit us to say that we think that the time has fully arrived when the township physician should have the entire sanitary supervision of the public schools. These are centers, whence too often emanates infection and contagion, and where the physical structure of the coming generations of men and women are too ofttimes wrecked for the want of some directing light. As important as is the office of the Superintendent of Public Instruction, it can scarcely be less so to have some functionary to guard the public health.

EGG HARBOR CITY. - *Report from* THEO. H. BOYSEN, M.D.

Water supply is, in most cases, now obtained from driven wells, which undoubtedly are to be preferred to the old open wells, because two or three clay beds are generally penetrated by the pipe, and thus a pure and uncontaminated supply is obtained which has never been known to fail, even in the driest seasons.

Excreta of all kinds are here composted and used as manures, which, owing to the porous nature of our soil, has as yet been without serious effect, but it is to be feared that, if continued as the country becomes more thickly settled and the soil impregnated, such affections as typhoid fever, which are at present almost unknown, and, when met with, of mild form, will become vastly more frequent and deadly.

Our school is now thoroughly equipped and furnished throughout with the most approved and health-preserving furniture. The doors have all been changed in order to comply with the law enacted last winter, and a Babcock fire extinguisher is kept in the building for use in case of emergency; in fact, the entire school is as perfect as can be desired, except in the matter of ventilation, which must be entirely effected through the doors and windows, thus causing draughts which are surely not conducive to the health of the children.

We are now about preparing a health code and ordinances governing all matters relating to public health, registration of vital statistics, quarantine, and sanitary expenses.

During the past year we have enjoyed a fair degree of public health. Of contagious and infectious diseases we had last winter a short run of measles, and, during the last month, a few cases of scarlet fever.

HAMILTON TOWNSHIP. - *Report from* D. B. INGERSOLL, M.D.

There have been no epidemics or special diseases during the year. We have had but few cases of *pure* typhoid fever, and yet there have been a few cases of such. We again have to report some cases of typho-malarial fever. None of these fevers have been of a severe form. A few cases of measles occurred at Weymouth, brought there by families moving into the place, yet these have been confined chiefly to those families.

We are glad that the last Legislature passed an act prohibiting the sale of tobacco to minors under a certain age. But this act is made of almost non-effect by its making the parent of the minor the prosecutor of the offense. In nine cases out of ten these parents will never prosecute. A supplement should be enacted that would correct this difficulty, by making it the duty of any one to prosecute.

We would also call attention to the danger that we of the rural districts are subject to by the allowing of dogs to run at large. They are permitted to run at large both day and night, and wander over the town in search of food; thus they are constantly in the streets, and liable to be bitten by any dog which may have hydrophobia. Should one of these dogs be bitten unbeknown to the authorities and be seized with hydrophobia, the evils that might ensue cannot be estimated.

BERGEN COUNTY.

PALISADE TOWNSHIP. *Report from* S. E. DEMAREST, *Secretary.*

The population of the township is a very stable one, so that there is but little change from year to year. The great majority of the houses are occupied by their owners, so that there is little moving from place to place, and the sanitary condition of most of the dwellings is well looked after. The cellars are used mostly for the storage of vegetables during the winter months, but in the spring they are generally very thoroughly cleaned out and ventilated.

RIDGEWOOD TOWNSHIP. - *Report from* THOMAS TERHUNE.

The chief nuisance is the standing and unloading of cars loaded with manures, in close proximity to the depot and public street.

UNION TOWNSHIP. *Report from* JACOB G. VAN RIPER, *Secretary.*

On the westerly side of the marsh-land is a ridge of high land, occupied as residences. This ridge of high land is sloping to the

marsh-land, consequently all the drainage and natural sewerage of the population flows in the creeks and ditches of the marsh-land. Formerly this ridge of high land was considered and known as a healthy location, but since the railroads and sluice companies have dammed and shut out the natural flow of tide-water in these natural drainage creeks and ditches, the drainage and sewerage from the high land make stagnant pools of filth on the borders of the high land. Fevers have been prevalent in dry seasons. As evidence and proof of the above, this season we had frequent rains, which purified these stagnant pools of filth. No fever. But as soon as the dry weather came, in August and September, fever cases were reported, and we may expect to have fevers every dry season, until the tides are allowed to flow in and out of these natural drainage creeks and ditches, to carry off these pools of filth.

BURLINGTON COUNTY.

FLORENCE TOWNSHIP. - - *Report from* N. A. BAKER, M.D.

Florence is located upon the banks of the Delaware river; has a population of about 1,100. The climate is variable. It has a large pipe foundry and about 200 tenement houses. The majority of these houses are in blocks, alleys between, with water-closets along the alleys in which barrels have been sunk; these, in many cases, overflow, making the atmosphere and surroundings very offensive.

The registration of statistics is cared for by a careful and painstaking assessor.

During the winter of 1882–83, we had what might properly be termed an epidemic of pneumonia, not of a very severe or low type, however, with no deaths.

Diphtheria we have constantly with us, but never as an epidemic. Cholera infantum, when it occurs in the foundry or tenement houses, is singularly fatal.

SOUTHAMPTON TOWNSHIP. *Report from* SAMUEL E. BRANSON.

We have a great deal of fever and ague.

EASTAMPTON TOWNSHIP. - *Report from* THOS. L. SHERMAN.

Our water-supply is from ordinary pumps, except in the village of Smithville, which is supplied by a force-pump from the shops and

ordinary pumps and wells; about twelve houses have hydrants in them. The water is very good; the hydrant-water is soft and not fit to drink in summer, but good in winter. It is pumped from the Rancocas creek, with no sewage emptying in it of any account.

Drainage is very good. Cellars dry. No swamps; but malaria is frequent when the creek is low, but that will be prevented hereafter. The H. B. Smith Machine Company have been depending entirely on the creek for their power but are now putting in steam, and the creek will never be lowered so that it will injure public health hereafter.

CAMDEN COUNTY.

HADDON TOWNSHIP. - - *Report from* J. STOKES COLES.

October 31st, 1883. Our local Board held a meeting this evening to hear reports from physicians and others. C. H. Shivers, M.D., gave us a lengthy report, and F. E. Williams, M.D., one not so full of particulars. After reading them over the Secretary was requested to make report for the State Board of Health.

To the State Board of Health, Trenton, N. J.:

GENTLEMEN—After safely disposing of the case of small-pox, last May, this Board has had no case of any kind brought legally before them, and but slight complaint of any kind. Our township has been free from any epidemics, and the death-rate less than usual. Our officers and others are most of them punctual in sending in vital statistics returns.

C. H. Shivers, M.D., reports: Wells are the almost universal source of water-supply in Haddonfield, and our water will compare favorably for purity, softness and good taste with any water in the world.

This assertion, however, must be qualified by excepting the water in that portion of the borough bounded on the north by Park avenue, on the west by Chestnut street, and extending east and south to an indefinite distance beyond the borough limits. The land thus described contains a stratum of marl at a distance of from twenty to forty feet from the surface, which gives to the well-water a disagreeable taste and odor of sulphuretted hydrogen. Most of our wells are dug through a stratum of conglomerate ironstone, and, consequently, contain dissolved in the water, traces of the oxide of iron. The surface-springs in this neighborhood deposit in their streamlets quite a crust of iron oxide. Our well-water is never discolored (marl water

excepted), never tastes badly and seldom fails, even during prolonged droughts. Our wells have never been contaminated with sewage as yet, but I regret to have to say that the time is not far distant when this almost exceptional well-water will become a breeder of disease, unless builders of new houses cease making bottomless sinks and other "latest improvements." I have always recommended, and practice it on my own property, to conduct the waste-water to the garden, thus fertilizing the soil, and, by evaporation and filtration, disposing of this powerful agent of death.

I have always recommended privies to be made without wells, so that the excrement might be cleaned out at least every month. It is not practicable to endeavor to make the use of cemented wells and sinks universal in a town like this. Many cannot afford it.

As above stated, Haddonfield needs no other than the natural drainage, and from its elevated position has very dry cellars. Around its easterly, southeasterly and northerly border there is a chain of creeks and ponds with their accompanying malaria, but away from their vicinity the town is fairly free from it. We also enjoy almost an entire immunity from typhoid fever. There are no sewers.

All our houses have cellars, and probably a half dozen have basements. Many people store potatoes in their cellars. We have no tenement houses.

Many of our cesspools have cemented sides, and some are made by sinking a bottomless hogshead in the ground. There are no cesspools with cemented bottoms, to my knowledge.

This summer and fall we have had five or six cases of typhoid fever in the country near Haddonfield, and one case in the town itself. Three of the cases in the country came under my own care, and all of these had been in the habit of drinking water from the barn-yard pump. All the cases I know of this season have relapsed after an apparent convalescence of from three to five days. Almost all had the "rose-colored rash." Some had sudamina also. Epistaxis was a premonitory symptom with almost all of these cases. But one has died as yet, and his death was caused by a dinner of lamb chops. I mention these cases because the disease is so seldom met with here and because so many had relapses.

GLOUCESTER TOWNSHIP. - *Report from* JOS. E. HUFF, M.D.

The general condition of the township is healthy. Malaria is still quite prevalent, and seems to be much greater in the lower, marshy

districts, especially along a branch of Timber creek, the boundary line of this township, although in general it has not been as severe this year as last. A few cases of scarlet fever and typhoid fever occurred this fall.

STOCKTON TOWNSHIP. - - *Report from* P. W. BEALE, M.D.

As the small-pox is continually making its appearance in the township, we enforce vaccination and quarantine at the earliest possible moment.

Houses heated with stoves, mills by steam. Malaria is and has been the prevalent disease of this township for a number of years, but there is a marked decrease in the number of cases of the typhoid type, and, under proper treatment, most every case recovers. There has been under my own observation a number of cases of diphtheria, scarlet fever and small-pox. The reason I mention diphtheria and scarlet fever is, because the number of cases occurring this year, in comparison with those of three or four years previous, have been very considerably increased, and had not the utmost precaution been taken we would, no doubt, have had an epidemic of these diseases.

DELAWARE TOWNSHIP. - *Report from* F. E. WILLIAMS, *Sec'y.*

Cesspools are the usual termination of the drainage pipes and are seldom cemented, though, as a rule, they are placed at sufficient distance from wells to prevent any likelihood of contaminating the drinking-water.

At the April meeting it was reported that several dogs had been bitten by a rabid dog in the township, and that the owners had not killed them; the Board ordered them killed, which order was complied with by the owners.

There has been no contagious disease reported during the past year, except that during the past winter there have been numerous cases of scarlet fever, diphtheria and whooping-cough in the township.

Malarial fevers during the past summer have not increased, but rather diminished, taking the form of remittent-malarial and typho-malarial fevers.

CAPE MAY COUNTY.

CAPE MAY CITY. - - *Report from* JAMES MECRAY, M.D.

We have needed to do very little with our sewers during the last year;. most of the work being done by individuals or by corporations

(private). The Stockton and New Columbia have been remodeled. The Stockton Hotel Company have expended nearly $10,000 in perfecting their drainage, and with complete success; as last season there was not a case of fever in the hotel, or in fact in the city. The Board has been called out twice only during the summer, and then to view pig-sties.

The water-supply is unchanged, and is perfectly satisfactory. Am pleased to state that Cape May Point is being sewered on the same plan as Pullman. We know from experience that it was not begun before it was needed.

LOWER TOWNSHIP. - - *Report from* AARON WOOLSON.

Hog cholera prevailed to some extent. We have had complaint of several hog-pens as a nuisance. The Board notified the owners, and they stopped the nuisance at once.

CUMBERLAND COUNTY.

DEERFIELD TOWNSHIP. - *Report from* C. C. PHILLIPS, M.D.

Ventilation of the houses good and attended to better each year; heated principally by coal stoves and heaters in cellar.

Occasional typhoid fevers and typhoid condition of other diseases. But, take the whole township, it is a healthy one—second to none in the State—very few deaths occurring. People cleanly, industrious and intelligent.

FAIRFIELD TOWNSHIP. - - *Report from* HENRY S. LONG.

During the early part of the year influenza prevailed throughout a greater part of the township with very little complication; very few cases accompanied with pneumonia, and we believe there were no fatal cases. About the same time, or shortly after, measles, as an epidemic, prevailed. No fatal cases are reported. The eruption in many cases was very full and extensive. Although this disease was very extensive in this township, yet we heard or know of no cases that did not recover perfectly.

We had some cases of dysentery during the after part of the season or summer.

Of our nuisances, we have to complain that there exists during the canning season a tomato-canning enterprise which, on certain days,

gives out very unpleasant odors. As the season is now nearly over, and for the present none seem to be annoyed, it is quite probable it will not be interfered with this season. Measures, however, should be taken to have it corrected before another season arrives and the same thing be repeated.

HOPEWELL TOWNSHIP. - - *Report from* C. H. DAN, M.D.

The county almshouse is situated in this township, and is located on high ground and in a healthy situation. It is heated by steam and has fair ventilation, but is in an over-crowded condition. The prevalent diseases of the year have been: in the early spring, measles; and during the late summer and early fall, malaria—which has been much more prevalent than usual this year.

ESSEX COUNTY.

BELLEVILLE TOWNSHIP. - *Report from* R. SKAINE, *Sec'y.*

A complete set of ordinances have been adopted by the Board, intended to enforce upon the citizens such cautionary measures as will best conserve public health.

Registration is observed, and reports of marriages, births and deaths are made in accordance with law.

No general vaccination has been ordered by the Board, but voluntary vaccination is quite general, and due precautions are exercised in all cases of contagious disease.

BLOOMFIELD TOWNSHIP. *Report from* JOSEPH A. DAVIS, M.D.

Investigations in sanitary science are more and more engaging the attention of the people. The proper ventilation of houses, the best methods of preventing the poisonous gases of cesspools from entering dwellings, the relation of cesspools and water-closets to wells, the effect of decaying substances thrown upon the surface of the soil, pools of stagnant water undergoing decomposition, polluted streams and ponds acting as fermenting vats and sending off their mephitic gases, and other sources of disease, are looked after with far more earnestness than formerly, and efforts are made as far as possible for their removal.

In our town, outdoor matters have for the most part engaged the attention of the committee. Pools of stagnant water and locations of wet soil have been sought out and received proper drainage. Cesspools

and water-closets have been looked after, and have been, with the coöperation of the people, to a considerable extent improved.

Contracts have been made by the township committee with the East Orange Water Company, to supply water in nine miles of pipe, for ten years, at an annual expense of $6,000. The work is partially completed.

Three thousand dollars have been expended upon the public grounds during the year, and strict attention has been paid to surface-drainage. No prevalent disease has occurred during the year, and it is evident that by following up the sanitary methods now in use great good will be accomplished.

CLINTON TOWNSHIP. - *Report from* M. O. CHRISTIAN, M.D.

The general health in the township has been excellent since April. Malarial fevers of all varieties, which prevailed extensively the three preceding seasons, were almost entirely absent this year.

The same can be said of diphtheria. While it was quite prevalent prior to '83, during this year it has been rarely met with in our township.

In the fall of '82, and continuing well along through the winter, cases of scarlatina were very numerous. During the latter part of the winter pertussis became the favorite and was introduced pretty thoroughly through the schools. This gave place in the early spring to an epidemic of measles, which continued along into April, since which time our vicinity has been quite free from infectious diseases, even cholera infantum having been rare, owing, probably, to the moderate weather of the past summer.

The only means taken to prevent the spread of infectious diseases here is the exclusion from the public school of children who are known to reside in houses where such diseases exist.

A nuisance which had been abated in '82 by order of the court, was continued again for a time this season. It was the garbage from the Newark market: fish heads, entrails, cabbage leaves and other debris usual about markets, received and deposited in an open cellar of large dimensions by a farmer within the village limits.

EAST ORANGE TOWNSHIP. - - *Report from* P. WOODRUFF.

The water company is private. Exact number of subscribers is not known to the Board. Water is never discolored. Tasteless. Neither hard nor soft. The water is uniformly good and the pipes

are cleansed. No reservoirs. No sewage is received. We have no data as to the number of wells or cisterns.

There are no sewers. Cesspools are largely built with open bottom and sides; are generally emptied by odorless excavating companies.

ORANGE. - - *Report from* THOS. W. HARVEY, M.D., *Sec'y.*

The water-supply, which was only projected at our last report, has become an actual fact. The city of Orange is now supplied with a plentiful supply of soft water, from the west branch of the Rahway. The water is brought by gravity, and has an ordinary pressure of eighty pounds, and furnishes an efficient fire service without the use of fire engines.

The summer has been remarkable for the absence of diarrhœal diseases in children. Dysentery, which was epidemic in 1882, has been very rare this year, and our death-rate for the year will be much lower than in 1882.

MONTCLAIR TOWNSHIP. - *Report from* JAS. OWEN, C.E.

There is a hook and ladder company, with forty-five members, with a truck supplied with extinguishers.

Two cemeteries are in the town, Rosedale and Mount Hebron.

The Board of Health organized this year and established a code of ordinances, which is very complete, for the sanitary improvement of the town. The efforts of the Board have mainly been concentrated in preventing the pollution of the streams by direct or indirect connection with cesspools; the proper cleaning of overflowing cesspools, care being taken in having the contents completely removed away; the prevention of garbage dumping, and the proper drainage of surcharged districts. As far as their efforts have extended they have been met with a hearty coöperation of all citizens, even those who were offending. The fact of having attention called to any trouble seemed, in almost every case, the only effort necessary for its removal, showing a strong and hearty interest by all citizens in sanitary matters. Where coöperation would have been necessary, the Board, in such cases, undertook the work themselves, and two or three bad localities have been radically improved. The great trouble, as in all suburban towns, is in getting rid of the sewage, and though all are anxious to do the right thing, yet the difficulties in the way are very great, on account of the want of proper knowledge by experts themselves in the matter.

The Board have as yet had no occasion to resort to any quarantine regulations. The physicians in town are all in hearty coöperation with the Board, and have reported any serious case to them, and investigations have been made into the cause.

SOUTH ORANGE TOWNSHIP. *Report from* A. A. RANSOM, M.D., *Sec'y.*

We have had one year trial from draining the mill-pond, as we let the water off last October, dug a channel through five feet on the bottom, thirteen feet top, some five or six feet deep; as we had this all done in the winter, we now have reclaimed about fifty acres of good land. Have had no malarial fever, or as little if not less than any year for the last eighteen years, the time I have lived here; and all these for the cost of $1,300. All are pleased with the result.

WEST ORANGE TOWNSHIP. - *Report from* EDMUND CONDIT.

The system of drainage is a natural one, and, owing to the rolling character of our territory, is probably as nearly perfect as human skill could make it. The cellars are mostly dry, and malaria is seldom found unless contracted elsewhere.

In most cases the houses have cellars, comparatively few have basements. The cellars are quite largely used for storing vegetables, &c. There are not many tenement houses of more than two families.

GLOUCESTER COUNTY.

GLASSBORO TOWNSHIP. - *Report from* JACOB ISZARD, M.D.

The drainage is not so very good on account of the flatness of the ground. The sewerage is very imperfect. The majority of the inhabitants are employes in the glass factories, who do not pay proper attention to their water-closets or drains from the pumps or wells.

Small-pox was quarantined last year, and all the children vaccinated in the township.

GREENWICH TOWNSHIP. - - *Report from* JOHN STETSER.

Two hundred dollars was appropriated at the annual town meeting to drain the streets of Paulsboro. Under the supervision of one of the township committee, the money has been used for that purpose, making a marked improvement in the surface-drainage of the township.

Slaughter-house has been kept in a healthy condition through the year, but one complaint having been entered, by only one person, of a nuisance during the year. The refuse not being allowed to accumulate so as to become a nuisance, and detrimental to health.

Cow-pens, hog-pens and privies have been kept in a good sanitary condition during the year, by the removal of their contents when necessary, under legal notice and inspection, so as not to be a nuisance to neighbors.

HARRISON TOWNSHIP. - *Report from* E. E. DE GROFFT, *Sec'y.*

Cases of malarial fevers, although having prevailed to a considerable extent during the spring and summer months, have not been so numerous as last year.

What few cases of typhoid have come under our notice have been traceable to stagnated pools of water and incomplete drainage.

Our people are pretty well protected against small-pox, there being very few children in our schools but what have been vaccinated.

WEST DEPTFORD TOWNSHIP. - *Report from* EDWARD J. LODGE.

At one of the meetings of the Board, it was resolved to use the authority of the Board to see after the vaccination of the children (if needy) at the expense of the township.

WOOLWICH TOWNSHIP. - *Report from* W. H. MCCULLOUGH.

The township Board of Health is in its infancy, this being the first year of our organization. There has been only one complaint against nuisances, and that was promptly attended to and abated.

HUNTERDON COUNTY.

DELAWARE TOWNSHIP. - *Report from* ASA H. HOLCOMBE.

We consider our township more healthy and less subject to malarial fevers than formerly. The prevailing disease of the various forms of malarial are mostly confined along the borders of the Delaware river, and the disease seems to be in a milder form than formerly.

FRENCHTOWN. - *Report from* GEORGE C. LANDON, *Secretary.*

In regard to sewerage, there seems to be no general system. Most families have a short covered drain leading from the kitchen into the

back yard or garden, and terminating in a cesspool, into which all slops are conveyed. Others do not take even this precaution, but throw the waste-water upon the ground in the rear of their houses.

The cellars and basements of most houses are in good condition. The walls of the cellars near the river are frequently very damp during the spring of the year, caused by the water coming into the cellars and remaining for some time. Latterly, however, the cellars have been better drained, and one cause of disease has been greatly lessened. As a general thing, the houses of this borough are in a first-class condition as to cleanness.

KINGWOOD TOWNSHIP. - - - *Report from* H. P. SHAW.

The general health of the township has been good—very few cases of sickness since the prevalence of dysentery last fall. Of the twenty deaths reported since October 1st, 1882, eleven were people of seventy years and upward. A few cases of malaria have been reported, but of a very light form.

LEBANON TOWNSHIP. - *Report from* A. S. PITTENGER, M.D.

Our water-supply is from springs and wells, except in a few instances among farmers, although our largest village in the township—Junction—is wholly dependent on cisterns, and it is in this village that most all our fevers, especially typhoid, exist.

Our Health Board is active, obey all summons, and in all cases strives to do its duty.

RARITAN TOWNSHIP. - *Report from* JOHN H. EWING, M.D.

From January, 1883, to April, 1883, diphtheria epidemic in the town of Flemington. During the summer months very few diseases incident to the season. At present time unusually healthy.

The local Board of Health, during the summer, has taken steps which will result in one of our largest open drains in Flemington being properly piped and closed. No flushing, except surface-water.

TEWKESBURY TOWNSHIP. *Report from* O. A FARLEY, *Secretary.*

Scarlet fever, malaria and phthisis have been the prevailing diseases. Scarlet fever prevailed as an epidemic, there being about one hundred and fifty cases and many deaths.

WEST AMWELL TOWNSHIP. *Report from* S. R. VAN BUSKIRK, *Sec'y.*

Well organized Board of Health; meets regular; looks after all matters.

MERCER COUNTY.

CHAMBERSBURG. - - - *Report from* WARD M. SMITH.

Cellars are generally dry. We have no sewers. Part of the gutters are paved, and part are not paved. Have heard of some few cases of malaria, which some attribute to the foul gutters in the borough. We have a very filthy pond in the borough, called Crow lake, which contains stagnant water and is very dangerous to health.

HAMILTON TOWNSHIP. - *Report from* GEORGE A. HUTCHINSON.

There were several complaints made to the Board of Health of Hamilton township during the year, which were all attended to by the Board. First was the dumping of night-soil on State street road, which was ordered to be removed and stopped dumping there, which was done; and, also, on Chambers' farm the same complaint, the dumping of night-soil, which the Board has also attended to, and the odorous smell stopped by covering it up. There was a complaint made from Hamilton Square concerning the state in which slaughter-houses were kept in that place, which was examined by the Secretary of the Board, and the same ordered to be kept clean, and all offal, from dressing animals, taken from the place, which was done and disinfectants used to keep the place in good order.

HIGHTSTOWN. - *Report from* J. P. JOHNSON, M.D., *Secretary.*

The mill-pond, which receives the sewage from Peddie Institute, (the Baptist school, numbering over 100 pupils,) is considered by the Board to be in a bad condition, and there is a disposition to have the matter remedied.

Two slaughter-houses are quite near dwellings, and some complaint is made of one of them.

A canning factory, which has been in operation for over a year, has been a source of much complaint. The large amount of refuse which finds its way into the brook running through the most thickly-settled portion of the town, becomes very offensive by lodging along its banks.

Malarial troubles have existed to about the same extent as during the year previous.

MILLHAM TOWNSHIP. - - - *Report from* J. J. CLANCY.

No system of drainage or sewerage. There are portions of the township where there is considerable standing-water after a heavy rainfall, and in the vicinity of this standing-water wet cellars abound. There are swamps and malaria is frequent.

Houses, generally, have cellars, and are not tenanted. Many use the cellars to store away vegetables.

No system for removing refuse and excreta. Privies are usually cleansed yearly by scavengers.

PRINCETON. - - - - *Report from* J. S. SCHENCK.

The most important event of the year is the introduction of public water of fine quality and abundance. Will soon come into general use.

TRENTON. - - - *Report from* WILLIAM CLOKE, *Sec'y.*

The Trenton Board of Health has been very successful during the past year in accomplishing the objects of its existence. It has very materially improved the sanitary condition of the city. The reform upon which it plumes itself the most is the radical abatement of what was known as the "Water-Power Nuisance." This water-power, or race-way, of the Trenton Water-Power Company, winds for about a mile through the thickly-settled parts of the city. The people living along it are mostly mill operatives and factory hands. Nearly all whose back-yards abutted on the race-way built their privies over the stream. They also sewered into it from their kitchens. Several hundred privies lined the edge of the race-way, and innumerable gutters and spouts and sewers poured their nauseous burdens into the filth-glutted stream. The race-way was sluggish with foulness, and reeked with odors inconceivably vile. The Board addressed itself to the abatement of this nuisance immediately upon its organization, a little over a year ago, and its efforts have been crowned with complete success. Every privy has been removed, every sewer and sluice-way cut off, the banks of the stream have been nicely graded, and it is now as clean and sweet and wholesome as the Delaware river itself. The improvement has been very grateful to the people living along its banks. Instead of being stifled and made ill by its fœtid odors, they were able last summer to spend their evenings sitting upon its pleasant banks. To the New Jersey Steel and Iron Company the credit is largely due for promptly complying with the orders of the Board and making these improvements.

The Board also has in hand, with a fair prospect of success, the Petty's Run nuisance. They have begun proceedings in the Court of Chancery to compel people to cease polluting this stream with their sewage.

During the year, since my last report, over six hundred nuisances, of various magnitude, have been abated by the order of the Board and through the vigilance and activity of Inspector McGuire. The sanitary condition of the city is good and steadily improving. Our public markets are in excellent condition, the public alleys are kept pretty well cleared of garbage accumulations, and people are generally careful about the sanitary condition of their premises.

WASHINGTON TOWNSHIP. - - *Report from* JOHN B. YARD.

The Township Committee were called together on the 14th day of July last by order of the Board of Health of Upper Freehold township, to attend to the cleaning out the channel of the Carson mill-pond, in this township. The refuse in said channel had stopped the free passage of the water down through the meadows, and caused the water to back up and become stagnant in and about Sharon, a small village on the county line between Mercer and Monmouth, in Upper Freehold township. In consequence of the stagnant water there were a great many cases of diphtheria—some fourteen, I believe, were reported at once, and some were fatal. Our Board met on the said day and viewed the premises and decided to have it cleaned out in our township, and served notices on the land-owners on both sides of the stream, and it was done very promptly and effectually, but with several hundred dollars' cost. After we had ours cleaned out, then those on the upper end of the stream, in Upper Freehold township, cleaned theirs out, and I hear no more from it now. The water was so poisoned the fish died and floated on top of the water. Our physician said that he thought that the cause of the sickness was owing to the foul and dead water.

Our township is very clear of anything that is considered injurious to the health of the inhabitants. We have no factories of any kind to make any bad odor or anything of the kind. We get our drinking-water from wells, and it is mostly very good and pure, consequently the people are very healthy, perhaps as much so as any township in the State.

MIDDLESEX COUNTY.

NEW BRUNSWICK. *Report from* THOMAS L. JANEWAY, *Secretary.*

Only about one-third of the city is sewered, and this sewage empties into a slack-water, causing the return of noxious and mephitic gases upon the town. It is scarcely necessary to point out its insalubrity. Water is supplied to the city by means of hydrants and wells and pumps. Previous reports have clearly demonstrated that some of our wells have unquestionably caused sickness. The Common Council have been memorialized upon the subject and have failed to abate the causes of disease.

The cellars in the lower part of the town are almost uniformly damp, perfect drainage being impracticable, owing to the fact that the water-level of the Delaware and Raritan canal, running in front of the city, is above that of the bottom of the cellars. The only efficient relief for the existing state of affairs would be found in the construction of a sewer running the length of the town, or in the removal of the slack-water formed by the canal above referred to. Therefore, we may unhesitatingly say that the drainage of a large portion of the city is decidedly bad. Cesspools exist in many parts of the city, and as they are not closely built must allow saturation of the soil.

[I have personally examined the drainage and sewerage of New Brunswick, and must fully confirm these views.—E. M. H.]

The city of New Brunswick has suffered in a moderate degree from scarlet fever, diphtheria, measles and intermittent fever, the latter having been confined to restricted localities.

This Board would call attention to an effort recently made to interfere with the practice of vaccination in our public schools. In our judgment this can only result in evil, as being contrary to the experience of the world during the last century.

PERTH AMBOY. - - *Report from* E. B. P. KELLY, M.D.

Water-supply is public, furnished by a private corporation, known as the Perth Amboy Water Company, from a stream at the westerly boundary of the city, known as the "Five Oaks." The water is soft, and slightly discolored, which will probably be remedied by a filter in the reservoir, now in course of construction. Comparatively a small portion of the inhabitants use it, preferring wells and cisterns, as being more economical.

Sewers are constructed upon the most approved plans, properly ventilated, and arrangements are made for flushing, as often as necessary.

Due care is taken in regard to contagious diseases, and the law relating to vaccination of children is rigidly enforced.

PISCATAWAY TOWNSHIP. *Report from* Dr. A. S. TITSWORTH, *Sec'y.*

An epidemic of measles swept over our township, and in some instances nearly broke up the schools; and although some cases were marked with great severity, there were but few fatal cases, and nearly all of these were the results of complications.

There have been a few cases of scarlet fever, but this disease has not been very prevalent.

There has been an unusual tendency to diseases depending upon so-called malarial influences. Intermittent and remittent fevers have been unusually prevalent, but have generally yielded to proper treatment.

WOODBRIDGE TOWNSHIP. *Report from* S. P. HARNED, M.D., *Sec'y.*

Drainage by natural water-courses, brooks, creeks, &c. Most cellars require drains, which secure dry cellars. Have had less malaria than for many years past.

Some varicella. Acute dysentery has prevailed, more than in any year within the last twenty years.

MONMOUTH COUNTY.

ASBURY PARK. - - - - *Report from* H. MITCHELL.

Since September 1st we have had nine cases of typhoid fever. The type has been mild, only one death resulting. We believe that the appearance of this disease is unquestionably due to the pollution of certain wells by casting waste-fluids upon the ground.

The sewers have satisfactorily performed their duty, and seem to be without objection at present, except concerning their ventilation. The street openings have in some instances been offensive. The outflow has been free from objection during the past year. No odors have existed at the outfall.

KEYPORT. - - - - - *Report from* S. V. ARROWSMITH.

We have no systematic system of drainage nor sewerage. A blue clay subsoil, which underlies the greater part of the town, causes considerable dampness in basements and cellars.

Malaria has prevailed to about the usual extent, generally in a mild form.

LONG BRANCH. - *Report from* E. B. BLAISDELL, *Secretary.*

Drainage and sewerage very incomplete. Hotels and large buildings have large sewers and cesspools on the premises. Dwellings generally have no particular system, and water-closets in the general country style. The city Board of Health, but recently organized, hope to remedy the evil as fast as possible.

The Board of Health has been but recently organized, and have adopted a set of resolutions, and hope to improve the condition of the city as fast as possible.

MATAWAN TOWNSHIP. *Report from* BENJAMIN GRIGGS, *Secretary.*

The Board has had a diligent oversight of the sanitary condition of our township.

No report of nuisances has come to our knowledge. There has been no epidemic or prevailing disease of any kind, and our locality during the year past has been, with very little exception, unusually healthy.

OCEAN GROVE. - *Report from* REV. A. E. BALLARD, *Sec'y.*

The surface soil is composed of sand, reaching down to various depths of from two to forty feet. Underlying this is a strata of variously colored clay, which is underlaid again by gravel. Below this, so far as we have been able to test it, for a depth of from 100 to 120 feet, is a mass of black clay, after which is a thin layer of sand and shell, followed again by the thick black clay to a depth nearly 300 feet; after which comes again sand and gravel for fifteen to twenty feet, and filled with excellent water, which comes to the surface in an artesian well, with a product of fifty gallons per minute. This experiment has been made at great expense, and settles the fact that at a depth of 422 feet, water, tested under the direction of the State Geologist, and certified by him to be of the purest quality, soft and healthful, almost entirely free from mineral matter, can be obtained

in almost unlimited quantities, and beyond the reach of possible contamination.

It is under consideration to increase the number of these wells, as circumstances may call for them, until there shall be a full supply for all the cottages and hotels of the Grove.

The general water-supply is at present mostly obtained from "driven wells" at a depth varying from eighteen to forty-eight feet. Except in the vicinity of a small area near the sea-shore of Fletcher Lake, where there is a marshy taste, it appears, from the scientific tests which have been applied, to be good. The difficulty near Fletcher Lake has been remedied by setting the wells a few feet further away. In some cases the water has been found so impregnated with iron from the corroding of the pipes as to lessen its pleasantness for culinary and drinking purposes, as also for washing. This is being obviated by the introduction of pipes properly galvanized, and inserted in tile wells with either porcelain-lined or wooden pumps.

There have been three cases in which it has been supposed that water deterioration might have come from contiguous cesspools, but investigation failed to show its certainty, and the causes remained unknown. The wells were changed and the difficulty disappeared, except in one case where the cesspool has been removed and the well remains for the purpose of testing. There have been no cases of sickness attributed to water.

The proposition is now to make the supply from artesian wells, which shall be carried through pipes into all the houses of the Grove, and replace in this way the wells now so near to the surface.

The whole place is being sewered as rapidly as possible. Already 23,550 feet, making four and a half miles, are laid, and arrangements are being made to complete the system as rapidly as possible. The system brings all sewage matter into one main pipe, which discharges into the sea at an average height above high-water of four inches, at the foot of Embury avenue. It is taken out for a distance of 500 feet into the sea, in a flume made of Georgia pine, which flume is bolted to piling driven down to the ocean floor under it, and by its side above it. The natural descent is so great that the flow is continuous, and but little offensive odor when opened, and no perceptible odor where it empties into the sea, while the discoloration of the water, wherever there is any, does not extend over three to five feet. There has been no offensiveness from it in connection with the bathing, and no odors along the vicinity since the old ventilators have been closed and the

old cessvaults taken away. The works have been erected at a very heavy cost, but it is believed by us that they have solved the question of an outlet for the sewage which shall be in accord both with the laws of taste and health. Our maps are so constructed that all under-ground work, all pipes and the contour of surface, is easily understood and determined. These sewers comprehend the more populated parts of the Grove, and are being extended with the extension of the population.

A number of plans are being considered by which the entrance of sewage above the lake can be prevented, and also by which the lake can be more effectually cleansed, but none have as yet been adopted.

Many of the water-closets are connected with the sewers, and it is the policy of the Association to have them all connected at as early a day as may be found possible.

A plan has been devised, and partly carried out during the past year, to inspect the sanitary condition of every house in the Grove. It is intended to complete the plan during the coming season. The hotels, with a very few exceptions, have all been inspected from garret to cellar, with all the surroundings, by the Secretary personally, and reports kept in a book of minutes. All private houses, where there has been any suspicion or complaint, have been officially inspected by the same officer, and where any offensive or unhealthy condition has been found to exist, the evil has been remedied at once, and, in the owner's absence, charged to the property. In almost every case the property owners have been found to be anxious to coöperate with the Board of Health.

Garbage is collected every day during the warm season, and two to three times during the week in the winter, from tight barrels, and carried away in tight wagons to a distance of four miles and buried, at a contract cost of $1,200. The grounds are carefully raked every day and the refuse carted away.

OCEAN TOWNSHIP. - *Report from* GEO. W. BROWN, M.D.

There is nothing of special interest to report this year, as a "city Board of Health" has been organized since our last report, and most of the sanitary work has been within the city limits.

We are still well organized, however, and have at times found work to do. Since our last report we have adopted a sanitary code similar to the one governing the city of Trenton.

SHREWSBURY TOWNSHIP. *Report from* JOHN S. THROCKMORTON.

One sewer, extending from Mechanic street, Red Bank, to the river, twelve-inch pipe. Cesspools built now are all cemented; the old ones are emptied with steam force-pump into tight barrels and carted away.

No prevalent disease. Some malaria in a few localities.

The Board of Red Bank inspect the slaughter-houses, and have had them kept in order to the best of their abtlity. Still some complaints arise, which are immediately attended to.

UPPER FREEHOLD TOWNSHIP. *Report from* H. G. NORTON, M.D.

We would report Cat-tail brook as opened, and an extensive meadow drained, under the direction of Mr. Geo. Vanderbeek, Assessor. After draining the lowlands around Sharon, which were much of the time overflowed by this brook, much of the sickness in the vicinity disappeared as by magic, especially diphtheria and malaria, which had been rife during the early spring and preceding winter.

There are, in our township, several cesspools with open bottoms, bricked sides, which are irregularly cleaned, generally not until they become full of offensive matter.

Three years ago malaria became very prevalent across our southern line in Ocean county, in a section of pine country always, until then, free from anything like malaria; not until the present fall and summer has it seemed to spread from its origin—in and about Prospertown—while, at this writing, chills is the almost universal complaint in the southern portion of the township.

This summer, disease has shown itself among the hogs; wherever it has appeared the farmers have lost all, or nearly all, of their hogs and pigs. Six farmers have been heavy losers, having lost their entire lot of hogs. As our township produces probably the heaviest pork yield of any in the State, the disease, as it has appeared among us, causes much apprehension, and deserves careful study.

This fall has been characterized by a more than usual amount of typhoid fever, but it seems extremely hard to convince people that there is any connection between poor drainage, cesspools and shallow wells and the fever.

There was an extensive epidemic of measles last spring, but not one case terminated fatally.

MORRIS COUNTY.

MORRISTOWN. - - - - *Report from* C. F. AXTELL.

The water-supply of Morristown is excellent, pure spring-water, furnished by the Morris Aqueduct Company. The supply is not only pure and good, but believed to be adequate.

The natural drainage of Morristown is fairly good, but we need now a system of sewerage. The cesspool business ought to go forever.

Refuse is deposited on a public dumping ground in trenches, and these covered with fresh earth.

There are no slaughter houses or abattoirs in the city limits.

There is no regular quarantine or care over contagious diseases, except as necessity demands. If aggravated cases appear, they are isolated as far as possible from outside communication, under the direction of the Board of Health and City Physician.

MT. OLIVE TOWNSHIP. - - - *Report from* JOHN D. BUDD.

The health of the township has been fair, and, we think, an improvement on former years. Those who were affected, by cleaning their wells properly have improved the conditions of their families and surroundings.

We are decidedly against any further centralizing of power in law to county physicians; as aside from the inconveniences and costs of calling on him as to the cause of sudden death, it is unjust to local physicians and acting coroners, who, as a general thing, are far better posted in their duties as to the cause of death than any doctor appointed by any Board of Freeholders or otherwise, and we shall strenuously use our influence politically, as representatives of both the great political parties, against county centralization of the powers of the Board of Health. We are willing to receive the authority of the State Board, but claim our own township rights.

ROCKAWAY TOWNSHIP. - - *Report from* ELIAS B. MOTT.

Very few changes, affecting the sanitary condition of our township, have occurred since our last report, October, 1880.

Much might be said in regard to our supply of water for drinking and cooking purposes. It is very much to be regretted that no adequate provision has been made for obtaining an analysis of the water

in some parts of our township, obtained from wells, and which I believe to be unhealthful. This would necessitate a knowledge of the structure of the soil, with its effect on the purity or impurity of the water. A thorough knowledge of this subject in all its relations to health would, I believe, cause the abandonment of some of the present sources of supply, and cause other means to be adopted for its obtainment. Although a hilly country, with many fine natural springs and consequent streams of clear water, the greater number of our population depend almost entirely on wells and cisterns for supply. In some parts of the township the wells contain an undiminished supply of pure water throughout the year, regardless of climatic changes. In other parts both the quantity and quality change with the change of seasons, and in some instances are unfit for use during the latter part of the summer months. This is true as regards some parts of the village of Rockaway, and also some of the mining villages. As regards the mining villages, the proximity of mines, many of which are far deeper than the wells, may explain one of the causes; in the other case, perhaps, the geological structure of the earth, or not being sunk to a proper depth, may explain the cause. Quicksand underlies a portion of the surface in our village (Rockaway), rendering it a very difficult feat to obtain water by means of wells. A resort to cisterns is the result. These are constructed in the usual manner, and many of them contain filters, usually a cemented brick partition through which the water must filter. Many are provided with turn-offs, to prevent the first rain-fall from carrying impurities, deposited on the roof, into the cisterns.

But many others are not in good condition, some are built under the houses and the air completely excluded, seldom cleaned, and no means to prevent roof-washings from being deposited into the cisterns. A few have iron pipes. Lead is in general use.

The natural drainage is good, but in some instances artificial drainage is absolutely necessary to prevent disease. This is the case at Mount Hope. On each side of the ridge, containing the ore, is a swamp. The people residing in the vicinity of this swampy land had been afflicted with malaria in its many forms for several years. The present superintendent, Mr. Matson Williams, has caused these swamps to be drained, and malaria is now no more prevalent than elsewhere. Other instances of the beneficial effects of artificial drainage could be mentioned, but still more instances where benefit would accrue from having it done.

There is probably not a brook or stream in the township used to carry off sewage. Cesspools and out-of-doors water-closets are not usually planned and arranged with a due regard for healthfulness. There is not, probably, a cemented cesspool in the township. A trap, inserted somewhere between the kitchen sink and the cesspool, is usually considered a perfect safeguard against any noxious gases or odors arising from this depository of nastiness.

The refuse and excreta from stables, in the villages, are readily disposed of to neighboring farmers, but not so with contents of privy vaults, which remain (in some instances) uncleaned for years. In many instances the closet is removed to a new vault, and the old one covered with earth, as the easiest method of disposing of the matter.

OCEAN COUNTY.

EAGLESWOOD TOWNSHIP. - *Report from* WM. P. HAYWOOD.

Nothing favorable. School houses in a tumble-down condition, and too small and badly warmed and ventilated for cow-houses; too small for the children in attendance. Trustees mostly have no children, and do not urge that their neighbors' children get an education.

LACEY TOWNSHIP. - *Report from* MARCUS KENYON, M.D.

No contagious diseases, but five cases of typhoid fever; the customary precautions taken to prevent spreading. Vaccination not well kept up.

PASSAIC COUNTY.

PASSAIC CITY. - - - *Report from* F. H. RICE, M.D.

The open-bottom cesspools are in use, and usually emptied by pump. We have had less malaria this year than ever before.

PATERSON. - - - - - - - See page 172.

POMPTON TOWNSHIP. - - *Report from* CLARK W. MILLS.

Drainage and sewerage is of the most primitive kind. There are many small swamps whose outlets are natural, which cause more or less malaria in their immediate vicinity.

WAYNE TOWNSHIP. - - *Report from* RICHARD J. BANTA.

There are many defects in the natural drainage, especially in the western part of the township. But parties owning those lands have seen the necessity of having the land drained, and I have no doubt that, before the next report, it will be properly drained.

It has been very healthy the first part of the season, but at present there are quite a number of cases of malarial fever.

WEST MILFORD TOWNSHIP. - *Report from* THEO. D. COURSEN.

Malaria still prevails throughout the township, but there is a marked absence of the more severe forms.

SALEM COUNTY.

MANNINGTON TOWNSHIP. *Report from* D. F. GRIER, *Secretary.*

We have had some trouble with contagious disease on a farm of Isaac Smith, about one mile from the Hogan farm. In the month of June last he lost six head of cattle and three colts. The disease was anthrax fever. The feeding-grounds were low and springy, about the same as Hogan's were. * * * We had the stock put on different feeding-grounds. First, all died in about three weeks. It was a milk dairy, and the cattle were fit for the butcher. I think one of the best herds in the township. The stock appears to be all well now; none have died since June last.

QUINTON TOWNSHIP. - - - - *Report from* G. A. AYARS.

Three school houses in township. Should be more by all means. They are wanted, and very much needed.

SALEM. - - - *Report from* JOSIAH WISTAR, *Secretary.*

The surface of this, as well as of the surrounding country, is flat, with an elevation above tide-water barely sufficient for good drainage. In former years, when the meadows and low grounds which border our numerous tide-water streams were but partially drained, the town and adjacent country had a reputation for unhealthiness—chills and fevers generally prevailing during the autumn of each year; but for the past thirty years the low lands above alluded to have been more thoroughly drained, and, as a consequence, this vicinity has been as free from malaria as any other locality.

Until within two years past we had no water-supply except that obtained from wells and cisterns; the well-water being hard. The city is now supplied with water from Laurel Run, which is dammed for that purpose, and the water forced through iron pipes a distance of three and one-half or four miles by a steam engine, on what is known as the Holly system. The works were built and are owned by the city. The water thus supplied has not as yet been much used for drinking, except to some extent last winter, its quality during the warm months not having been entirely satisfactory. This Board has had the matter under its care, and made certain suggestions to the city council for its improvement, some of which have been carried out with good effect, and it is hoped time will remedy some of the evils heretofore complained of, particularly as there is no cause of foulness in the stream itself, it being fed by numerous springs. It has been introduced into nearly two hundred buildings or premises, and it is believed its quality will be improved the more it is used.

The streets of our city have been graded, and are well drained by paved gutters, but no public sewers have as yet been built. Some houses in the lower portions may have water in their cellars during the spring or when the springs are unusually high, but generally the cellars are entirely dry, much more so than before the present system of drainage was perfected.

The city not being compactly built, and the lots being of considerable depth, outhouses or privies need not, in most cases, be placed near enough to dwellings to occasion inconvenience or endanger health. But this Board feels that it is a subject that must claim its attention, and has already, in one or two instances.

The slaughter-houses are located to the south of the city, but within its limits, and, when built, were a sufficient distance from any dwelling not to cause annoyance. But as new houses have been built, and the city extended in that direction, complaints have been made of the unpleasant smell occasioned by decaying blood and refuse. A committee of this Board now has the subject under care, and confidently hope to remedy the evil.

We have not been called upon to deal with any contagious or epidemic disease since our organization, except some cases of small-pox, which occurred during the spring and early summer, three of which proved fatal. The Board quarantined the inmates of the houses where the disease existed, and used such other means as were deemed best to prevent its spread, and made certain suggestions to the Board

of Education in regard to the vaccination of the children attending the public schools, which they have adopted. Our population comprises quite a number of colored families, and it is from these we have most to fear in regard to this disease. The Board of Chosen Freeholders have been considering the expediency of building a pest-house for the accommodation of persons afflicted with contagious diseases, and which we hope will be completed in the near future. The expenses incurred in the care of the cases alluded to were borne by the city.

Though the Board has been in existence but a little more than a year, and has not the benefit of long experience, yet we are impressed with the importance of preserving the public health, so far as it depends upon our efforts, and have desired to act in such a way as not to diminish, but to strengthen, our influence for good in the community. Having this object in view, we have endeavored not to interfere where action was not necessary, though at the same time not hesitating where the circumstances seemed to require it.

SOMERSET COUNTY.

BEDMINSTER TOWNSHIP. *Report from* WM. P. SUTPHEN, *Secretary.*

Malaria has existed. The Board officially notified the inhabitants of the southern portion of the town of Peapack to abate causes. The demands of the Board were complied with. The trouble then was malaria, and since that time, which was the middle of June, the town has been healthy.

There was no natural cause or earthly reason for malaria at that time, except one, a habit of letting unhealthy, filthy and poisonous matter lay around loose. The orders of the Board were obeyed; but it appears strange that people, who assume to be sensible, should have to be told to do things for the promotion of their own health, which common decency would demand, without the item of health being considered.

BRIDGEWATER TOWNSHIP. *Report from* WM. S. POTTER, *Secretary.*

Water-supply of Somerville and Raritan is by water-works of Somerville & Raritan Water Company, pumped in stand-pipe at Raritan from the Raritan river. Water is sometimes discolored from

rains, although the company has four large filters of the most approved and latest arrangement, filtering through white shore-sand, which does the work very well, it is said, in all ordinary kinds of muddy water; but our peculiar kind of red shale soil so discolors the water that it baffles the process for filtering for several days after a freshet. The water is soft. The filters are arranged by some back action for cleansing. There is no sewage in the stream or river above the point from where it is taken out of the river.

About half, or more, depend upon wells. A small proportion use cistern-water, arranged with filters.

Slaughter-houses are inspected by the Board of Health in summer time, and ordered kept as clean as possible. Also, all outhouses are ordered cleaned, and kept so, as far as possible.

No evil to health arising from any manufactories.

The Board issue circulars, and distribute them in Somerville, Raritan and Bound Brook, suggesting disinfectants and plans for preventing disease and sickness.

HILLSBOROUGH TOWNSHIP. *Report from* W. H. MERRELL, M.D.

Malaria has been less frequent than for two or three years.

During the winter and March, typhoid-pneumonia prevailed endemically. The type was severe, and several cases proved fatal. The Assessor inquires faithfully as to losses of animals and contagious diseases.

When the last report was sent, the Board were engaged with a nuisance at Van Aiken Station. When Mr. McPherson was informed in the matter, he expressed his determination to do everything in his power to abate the nuisance; and he did; and the Board needed only to advise in the matter.

MONTGOMERY TOWNSHIP. - *Report from* WM. OPPIE, *Secretary.*

In making my assessment this summer I have had a good opportunity to look over this township, and I found it in as good condition for cleanliness as could be expected. We have had no prevailing disease with us this season, and the general health of this township has been good.

What few cases of malaria we have had have been very light, and those mostly persons that came from other localities.

SUSSEX COUNTY.

STILLWATER TOWNSHIP. - *Report from* C. V. MOORE, M.D.

As to the health of the township, there has been less disease and sickness than usual, nearly the same amount of intermittent fever, less typho-malarial cases; a few cases of dysentery in the village of Stillwater, all yielding to treatment.

We have seven other reports from townships of Sussex county, which show that the assessors are attentive to their duties, but that town committees often fail to consult as to the health of the townships. Yet facts are before us which show that malaria factories exist in some localities in the county; that many children have been lost by contagious diseases which proper isolation and instruction would have prevented, and that a local outbreak of typhoid fever occurred, "which was very plainly attributable to polluted drinking-water."

—*Secretary.*

UNION COUNTY.

CLARK TOWNSHIP. - *Report from* WILLIAM J. THOMPSON.

The local Board of Health supervise matters relating to public health, and have acted promptly in all cases brought to their notice.

CRANFORD TOWNSHIP. - *Report from* JOHN W. CLOSE, *Secretary.*

The prevalent disease of the past year was dysentery, which at one time assumed a malignant form; but by prompt action of the Health Board in abating nuisances and using disinfectants, and the untiring efforts of Dr. MacConnell, we escaped a very severe visitation of the disease. It was principally confined to children.

FANWOOD TOWNSHIP. - *Report from* F. W. WESTCOTT, *Secretary.*

I know of only one instance of disease, where a farmer lost five horses; pronounced by the veterinary surgeon spinal meningitis.

A marked improvement in the cleanliness and care of our slaughter houses have been noticed, so that we have been entirely free from complaint or even cause for complaint.

This has been a remarkably healthy year. The only exception was last winter, when a number of cases of pneumonia existed, many

ending in death. Malarial fever seems to be on the decline, and not a single case of cholera infantum, to my knowledge, happened in the township last summer.

Fanwood has had an epidemic of measles during the past year of a very mild type. Typhoid fever is unknown in our township, not a single case to my knowledge during the past three years.

LINDEN TOWNSHIP. - *Report from* Dr. P. P. MEDLIN, *Secretary.*

Malaria has been the most prevalent of any other disease in this township this year, and of that, much less than formerly. A few cases of pneumonia, but one of which was fatal.

The sanitary condition of the township has been carefully looked into, and found to be very good indeed.

SPRINGFIELD TOWNSHIP. - - *Report from* W. B. STILES.

There is a belt of swamp land lying in the village detrimental to health. It needs draining. The bed of the stream would have to be lowered several feet for a distance of two miles, and if the State would make an appropriation for such a purpose, it would be a grand, good thing. There is occasionally a case of malaria in our township.

The assessor makes all necessary inquiry as to losses of animals and contagious diseases, and is ever ready to report any contagious diseases known to him to the Local Board.

SUMMIT. - - *Report from* DAVID M. SMYTHE, *Secretary.*

The water-supply is from cisterns, wells and springs. Many of the springs are impregnated with iron. The water from the wells is comparatively pure. Many of the cisterns are divided by a soft brick partition, through which the rain-water percolates and is rendered thereby very pure.

The depositories for sewage are cesspools, with cemented bottoms and sides, emptied by the "odorless process," the refuse matter, &c., composted and used for fertilizing purposes.

Our township is free from malarial diseases. Several cases of dysentery have occurred this fall, confined to the aged, and, with but one exception, have yielded to appropriate remedies.

The Secretary of the Board keeps a full record of vital statistics for local reference.

The care over contagious diseases, the removal and burial of persons dying therefrom, is regulated by this Board.

WESTFIELD TOWNSHIP. - *Report from* JOHN M. C. MARSH, *Sec'y.*

The local Board has the past year established a system of ordinances for the protection of public health, which have been obeyed, and but very few complaints have been made to the Board for their enforcement.

WARREN COUNTY.

FRELINGHUYSEN TOWNSHIP. - *Report from* F. HORBACH, M.D.

During the year malarial diseases, mostly of the intermittent type, cholera morbus, cholera infantum and dysentery have prevailed to a slightly greater extent than for three or four years previously, but never reached the dimensions of an epidemic. The only epidemic was of scarlatina. Commencing in February it lasted until July, and numbered fifty-six cases. Of the whole number, forty-five were mild and eleven of the anginoid type. Nephritis, followed by anasarca, occurred in eight, acites in seven, and diphtheria in one case. Three cases were fatal, the one complicated by diphtheria and two from the complication of acute nephritis. Enlarged cervical glands occurred as a sequel in seventeen cases, and facial paralysis in one. A few sporadic cases of measles, and three cases of röthlen are noted. Not one case of typhoid has occurred, and only thirteen cases of pneumonitis.

GREENWICH TOWNSHIP. - *Report from* WILLIAM SHERRER, *Sec'y.*

The health of the township has been good. No contagious disease among man or animals. Some malaria still exists. The water-supply is from wells, cisterns and springs. There was complaint in one or two instances of cisterns, during the hot weather of July and August. I think it was owing to the condition of the roofs of the houses, they being very old and rotten. Houses are lighted by lamps, dwellings are heated by stoves, using coal as fuel in winter and wood in summer. In general, dwellings are not provided with fire-guards or escapes.

HACKETTSTOWN. - - *Report from* JOHN S. COOK, M.D.

The year was characterized by a visitation of scarlet fever in the borough, during the months of April and May, of an exceptionally fatal type. We seldom have this disease to prevail as an epidemic, or, at any rate, this has been our experience during the past thirty years. Malarial fever, of a typhoid type, prevailed during February,

March and April, to which your attention was called as it visited the C. C. Institute. Other than these, our town experienced its usual amount of sickness. The present year has been, if anything, more than usually free from any visitation of disease. Malaria has prevailed, but not so generally or of so severe a form as of last year. The Board has been called upon to abate a few nuisances, brought to their notice by personal complaint, and have endeavored to remove them. They have made an effort to instruct the citizens of our borough as to the necessity of removing all sources from which disease may be developed, as well as to the course to be pursued during their prevalence. Enclosed you will find several orders issued by direction of the Board. Much can be done toward the prevention and the abatement of disease by calling the attention of the citizens to its prevalence, and as to what may be done to abate or prevent it. Local Boards can accomplish but little, if they are not supported to a certain extent by public sentiment. Once arouse the citizens of any community to see the necessity of taking a certain course of action and they will respond by initiating and carrying out whatever course may further the accomplishment of the desired result. Our Board is at present laboring under this difficulty. They wish to remove a certain source of disease, but cannot accomplish their purpose until the citizens are brought to see the necessity of making the necessary outlay of money to secure the improvement the Board thinks should be made. They hope, however, at no distant day, to receive the desired coöperation of every good citizen, and thereby remove from our midst a very fertile source of disease.

The following petition was sent to the mayor:

To the Hon. Charles J. Ruse, Mayor, and the Common Council of the Borough of Hackettstown:

At a meeting of the Board of Health, on the 8th inst., called by the President and regularly organized, to act upon a petition in writing and signed by three of our citizens, in which a complaint was presented against the drain or sewer running from Main street to the slough at the head of Bower's pond; the Board having resolved itself into a committee of investigation to view the premises, instructed the President to bring the matter to the notice of your Honor, and through you to the Council of our borough.

The drain is in an unfinished condition, as it empties into the slough instead of into the stream, and leaves a large deposit of surface-water,

after every rain, to run through the swamp and be exposed to the action of the sun. The citizens living in the immediate vicinity are not only annoyed by the noxious vapors emanating therefrom, but residences have been rendered almost untenable by them and the adjacent surroundings. The Board would recommend the opening of a ditch running directly from the outlet of the drain to the stream, which would prevent the spreading of the water discharged from the drain, over the surface of the swamp.

The Board also directed the President to call your attention to the condition of the whole pond, believing, as they do, that it is a fruitful source of malaria. In support of this belief, they would direct your attention to the many cases of malarial fever which has afflicted the families living on the east side of Main street, from opposite Centre street to Mill and Willow Grove streets, and down these streets.

They would also call your attention to the condition of the sink built in Liberty street, near the saw-mill, to receive the surface-water formed in that neighborhood. That there have been serious cases of sickness in that vicinity, of a malarial character, and aggravated by the surroundings, no one can deny. The annoyance of the mud and water in the street, although great to those who are compelled to traverse it, is as nothing when contrasted with the deterioration in the value of the neighboring property, and the detriment to the health of the citizens living near it.

They would also suggest that the condition of our main street calls for your active attention. They would not advise the adoption of any particular plan to remedy the existing condition, but would leave it to the good judgment of your honorable body to do something to remove the existing reproach upon our reputation as a desirable place of residence; and also the threatening of a terrible epidemic which, in consequence of its condition, may visit us at no distant day.

If there be one point where public sentiment should be sensitive, it is in the sanitary condition of the dwellings of the people and their surroundings. If the earth upon which these dwellings are erected, and the soil in their immediate vicinity, is not properly drained, and is permitted to receive and retain the garbage and the surface-offal deposited upon them, thereby giving rise to noxious vapors and a vitiated atmosphere, for every one coming within their range to breathe, there must be but one result, an increase of sickness and disease, and the longer these conditions are permitted to exist the more sure must the ratio of deaths in the community be seriously increased. Such a

condition is of vital importance, so much so that the proper authorities ought not to content themselves with official recommendations, but take immediate action of a most radical nature for its suppression. While our Board, as at present constituted, might be individually benefited, in a business sense, by neglecting to take the proper course to remove, as far as possible, all sources of disease, they claim to be actuated by a higher and more noble motive—that of the promotion of the public welfare. While they regret that their action on a former occasion was not seconded by your predecessors in office, and did not receive the assistance their recommendations warranted, they fully believe that if the opposite course had been taken, not only the number of cases of serious sickness would have been lessened, but the valuable life of at least one of our citizens might have been saved. It is, therefore, for your honorable body to determine whether you take such action to remove these obstacles to the health of our community, by passing the proper ordinances having in view their suppression, or permit them to continue, not only to bring reproach upon the good name of our borough, by driving from us many who might seek to make investments for the purpose of becoming residents with us, but to expose our citizens to the developing dangers we have endeavored to bring to your notice, the ultimate result of which must be the production of disease, so long as these conditions exist, and must certainly result in the sacrifice of many valuable lives.

Sinks and Drains.—The Board of Health desire to call the attention of the citizens of the town to the importance and necessity of looking after the condition of their cesspools and drains. The fact is well recognized that a large percentage of the sickness prevailing in our towns and in closely-settled communities can be prevented by taking the precaution of having this portion of our dwellings correctly constructed and kept in good repair. Every citizen should see that their drains have a capacity large enough to carry away from dwellings whatever liquid material may be thrown into them; that every pipe connecting with their sinks is furnished with a perfect trap, and that their cesspools have capacity sufficient to receive all material coming into them, and that they should be of sufficient depth to insure against the surrounding soil becoming impregnated with noxious material. Those having water-closets in their dwellings should be aware of the fact that these conveniences are not safe unless the drain-pipes are properly ventilated, and this cannot be done unless these pipes run from the closet directly through the roof of the dwell-

ing, so as to secure a circulation and draught of air through them and prevent the syphoning of the traps in the pipes running to the bath-tubs and wash-basins; and when the connections are at all complicated and numerous, the traps should be ventilated through a properly-constructed pipe, which any competent plumber can apply. With these simple precautions, much sickness can be prevented, and when we read of the many fatal cases of diphtheria, typhoid and typho-malarial fever which have been traced to their neglect and which could have been prevented by their observance, we can see the necessity of taking every precaution which may make more secure the happiness, comfort and life of every citizen.

Scarlet Fever.—The experience of this community during the past two weeks should impress upon the mind of every citizen that the scarlet fever is in our midst, and prevailing in a form that, for this locality, is exceptionally fatal. It is essentially a disease of childhood and unmistakably contagious, and every one should see the necessity of using every means of preventing its dissemination. The first and most important step to take is to keep the healthy from the sick, and, where this is impossible, seclude the latter and disinfect as far as possible every article that has come in contact with them. This can be done by the use of chlorinated lime, carbolic acid, and strict attention to cleanliness, frequent changes of linen, which, after being changed, should be placed in water containing these disinfectants, and then washed. The strength of these solutions can be learned from the attending physician. The best mode of disinfection for articles that cannot be washed, is to expose them to a high degree of heat and then give them a thorough airing. There are small articles used about the sick, such as small pieces of linen, which can be burned. Patients should be separated from each other whenever possible, for experience has proved that the neglect of this precaution has increased the severity of individual cases.

Thorough ventilation of the sick-room is of the utmost importance, and this can be accomplished without subjecting the patient to a direct draught of air, although in those cases where the temperature runs exceptionally high, this is of no injury to the patient. Those recovering from the disease should not be allowed to mingle with the well or those who have never suffered from the disease, until the skin has become smooth and well, and not then until the body has been thoroughly washed and dressed in clean, fresh clothes. To prevent the spreading of scarlet fever by means of well persons, brothers, sisters

and other members of the families of patients should be denied entrance to schools and public assemblies until the complete disappearance of the disease. These precautions are rendered the more necessary when we take into consideration the fact that even during an epidemic of a mild type, or when one or more members of the family have a mild form of the disease, a well child may take the disease in its malignant form and die, or may recover with some unavoidable sequel such as loss of sight or deafness. All display should be avoided at funerals of those who have died of scarlet fever, and the dead should be buried at the earliest possible hour circumstances will permit, and be kept shut off from all contact with the living during the time preparations are being made for the funeral, especially when the disease is of a severe or malignant type. Children should not be allowed to be present or take part in the funeral ceremonies. The opening of the coffin in the presence of the assembly of friends should not be permitted.

KNOWLTON TOWNSHIP. - *Report from* W. F. GREENE, M.D.

Malaria has been, during the past year, markedly on the increase in certain portions of the township. This increase is due to a variety of local causes, and to general atmospheric conditions. One of the former is the raising of a dam along Paulin's Kill, thus overflowing the low lands in the vicinity—the water remaining stationary and becoming stagnant. An undoubted cause is also the removal of trees and a thick, bushy growth covering a considerable area of marshy land in the vicinity of Hainesburgh and along Paulin's Kill, thus exposing the moist, marshy surface to the direct influence of the sun's rays. The great diurnal thermal changes during the past season have also been powerfully instrumental in producing this increase. Such rapid fluctuations of temperature, due in great part to the earth's nocturnal radiation of heat, very decidedly affect, according to medical authority, and indeed to common observation, the conditions of health, and exposure both to the midday heat and the night's chill appears to be a fruitful cause of malarial disease. Says an authority on this subject: "It is after or at sunset that the malarial influence prevails, and it tells most when a cold night follows a hot day." Watery exhalations also favor the increase of malarial disease. The above conditions, more especially that relating to atmospheric changes, have doubtless been influential also in the production of catarrhal fever, many cases having appeared of catarrhal inflammation of the mucous membrane

of the intestinal tract, accompanied with an unusually marked congestion of the membrane and copious sanguineous effusions.

All outbuildings seem to have been located with a proper regard to the water-supply, and, with a few exceptions, occupy the most advantageous positions in a sanitary point of view. Due attention also seems to be devoted to the cleanliness of these buildings, both in the removal of the accumulations when required and in the use of disinfectants.

Distemper, so called, appeared in one instance among horses. No spread of the disease was, however, reported.

OXFORD TOWNSHIP. *Report from* L. B. HOAGLAND, M.D., *Sec'y.*

During the months of May and June we had a very severe epidemic of measles in our township. In the town of Oxford about one-third of all the cases were followed by pneumonia, with a large proportion of deaths, principally due to careless nursing. Have also had an epidemic of mild scarlet fever, with no deaths.

WASHINGTON BOROUGH. *Report from* W. M. BAIRD, M.D., *Sec'y.*

Many cases of complaint have come before our Board the past year. The majority of these were easily disposed of, as the parties complained of would correct nuisances when the secretary would show them wherein they were at fault. With the first warm weather in the spring we had considerable complaint against the slaughter houses situated in borough limits. Some people were so radical as to demand their removal entirely from the borough limits. The Board, however, permitted them to remain, but insisted that the owners should keep them in such condition as would prevent their being a nuisance to any one. This they have done, and we have heard no further complaint.

During 1882 a public water-supply was brought to our town, thus making an increase in sewerage with no public sewers, and has been a means of considerable trouble. The most serious has been with the Washington Building and Loan Association, who own a large hotel property in the center of town. Their waste all emptied in a large cesspool, which had been full for over a year and was only kept from overflowing by frequently carting away part of the contents. But they became negligent as to keeping it down, and frequently allowed it to overflow and so become a nuisance. They then started to lay pipes to a small creek running through town, the pipes to carry the

overflow from the cesspool. The Board forbade this, as in dry weather the creek carried scarcely any water. Paying no attention to the Board, we secured a temporary injunction, and on the association agreeing to empty the contents of the cesspool in the creek only at such times as the creek carried a full supply of water and on approval of the Secretary of the Board of Health, and they paying the costs of the suit, we withdrew the suit. This suit has had an excellent effect, as it has convinced a strong association that they cannot defy the Board of Health any more than any other authorities. But the matter of sewerage is going to remain an important matter here until some means is provided for its disposal.

Lately the Secretary was asked to inspect the public school. This is a large two-story building, with garret and basement. They get their water from a cistern, and the privy-vaults are probably 100 feet from the building. In the basement is a steam-heating apparatus in one room, and the waste-pipes of this empty in a cesspool under the cement floor of the room. This became foul some years since, when the Trustees tore it up and found it to be simply a hogshead sunk in the ground. They made a brick cesspool, broken joints and arched over. Into this cesspool empty pipes from one-half the rooms upstairs, these pipes being connected with wash-basins in each room, and no trap of any kind.

In another room in the basement is another cesspool, into which empty the basins from the other half of the building, and no traps. This cesspool has never been taken up, and is presumably like the former in its original state—simply a hogshead sunk in the ground. An adjoining room in the basement has been fitted up recently for a primary department, on account of the over-crowded condition of the school.

It still remains to be seen what action the Board of Trustees will take in the matter. The argument already used is, that it cannot be seen why any expense should be incurred in changing when this has been there for a dozen years and no sickness has arisen. But we have an intelligent Board of Trustees, and I have no doubt they will correct it as soon as practicable. I think it about time that Boards of Education insist that teachers shall be sufficiently informed in sanitary matters to enter their protest against any such condition of affairs.

[illegible]

[illegible]

[illegible]

I. [illegible]

[illegible]

The [illegible] New Jersey [illegible]

From a valuable report [illegible] and their adulterations, it will be seen [illegible] detected in a considerable number [illegible] analyses, and in their [illegible] But safety to the consumer and the [illegible] only to be secured by a system of [illegible] The best interests of both manufacturer and consumer are most effectually served in this way.

[illegible]

At the request of the State Board of Health and the State Inspector of Milk, the Committee of Analysts made a careful re-examination of the composition of the milk produced and sold in the State, to ascertain whether the standard prescribed by the law for market milk had been set too high. The results of all the analyses, both individually and collectively, go to show that this is not the case. To lower the standard, in opposition to the fair and impartial evidence thus obtained, would be for the State to put a premium on the production and sale of inferior milk. The State Inspector of Milk and his assistants have already performed a service of most calculable value, and, in gratitude therefor, their hands should be upheld and strengthened by maintenance of the law as at present existing.

It now remains for the same system of personal inspection and control, which has been inaugurated in the case of kerosene and milk, to be extended to the articles intended to be defended from adulteration by the general law relating to the "Adulteration of Food, Drink and Drugs." This work can be best accomplished by a State officer, specifically intrusted with carrying the provisions of this law into effect. The gentlemen who have given their services to the State Board of Health, in some instances with none, in all the others for a nominal remuneration, in order that the public might be informed, by means of reliable investigations, of the adulterations actually practiced, have accomplished this preliminary work faithfully and well. The work of the future is that of carrying the cases, after the fact of adulteration has been established, into the courts of law, and no one but an executive officer, properly authorized and remunerated, would be able so to do.

REPORT OF DR. T. B. STILLMAN, SPECIAL DISTRICT INSPECTOR, AS MADE TO PROF. A. R. LEEDS.

DEAR SIR—In submitting this partial report on the examinations of illuminating oils, &c., for this district, I would respectfully state:

When the new law went into effect, July, 1883, the retail dealers, as well as the grocers, were entirely ignorant of the law's requirements respecting the flashing-point, &c. I applied to E. M. Hunt, Secretary State Board of Health of New Jersey, and obtained 500 copies of the circular issued July, 1883, relating to the inspection of oils, which circular also included the law as amended, to take effect in July, 1883. From a few examinations personally made in the city of Hoboken, I found that nearly all the grocers sold two qualities of oil, viz.: first, "Amber oil," having a flashing-point varying from 85° F. to 92° F., and selling at from eleven to thirteen cents per gallon; second, "White oil," or, as some called it, "Astral oil," having a flashing-point vary-

ing from 96° F. to 102° F., and selling for from fourteen to sixteen cents per gallon. The first oil, "Amber oil," does not come up to the test (100° F. flash) as required by law, and in every instance I could have commenced suit; but as many of the grocers had purchased this oil, not by flash test, but as 130° test, they evidently were not the proper parties to sue, but the wholesale dealers; and as this oil, in most cases, had been purchased before the law went into effect, I considered it better to notify each dealer personally of the new law, and by also leaving one of the circulars relating to the subject as issued by the State Board of Health. By this means all of the dealers in Hoboken, and part of Jersey City, have been notified, and have more or less complied with the law by refusing to purchase or sell any oil except "White oil," standing a test of 100° F flash. Nearly all the first class grocers refuse to sell the "Amber oil," as the margin of profit is small and the risk of $500 fine too great; and the cases where I have found the "Amber oil" sold are among the grocers supplying the poorer classes of the population. It would seem to be unfair to sue these grocers, but it would be just and right to make the wholesale dealers and refiners of the oils responsible. Not only this, but the actual "flash test," not "fire test," should be upon each barrel as sold. Most all the oil is sold as 150° F. "fire test," and, as the fire test has no relation to the "flash" test, the grocer has no remedy against the dealer of whom he purchases.

Below I give the tests as indicated on a number of samples from this district:

No. 1. Grocer, T. Ward, Hudson street and Newark street, Hoboken.—"White oil." Flashes at 99.5° F.; sells at 15 cents per gallon.

No. 2. Grocer, Grothusen, Washington street and Fourth street.—"Amber oil." Flashes at 89° F.; purchased from wholesale dealer, A. J. Brockwedel, Jersey City; selling price, 12 cents per gallon.

No. 3. From Messrs. Gardner & Dudley, Orange, N. J.—"Amber oil." Flashes at 85° F.

No. 6. Grocer, Woltjen Bros., Fourth and Bloomfield streets, Hoboken.—"Astral oil." Flashes at 97° F.; wholesale dealer, E. A. Brockwedel, corner Harrison and Hoboken avenues; selling price, 15 cents per gallon.

No. 7. Grocer, John Wurdemann, Third and Bloomfield streets, Hoboken.—"Astral oil." Flashes at 97° F.; wholesale dealer, E. A. Brockwedel; selling price, 15 cents per gallon.

No. 8. Grocer, Charles Booken, Second and Bloomfield streets, Hoboken.—"Amber oil." Flashes at 88° F.; wholesale dealer, Gouche, West and Bank streets, New York; selling price, 11 cents per gallon.

No. 9. Grocer, Charles Booken.—"Astral oil." Flashes at 98.5° F.; wholesale dealer, J. Donnelly & Co., Jersey City; selling price, 15 cents per gallon.

No. 10. Grocer, Woltjen Bros., Hoboken.—"Astral oil." Flashes at 99.5° F.

No. 11. Grocer, Winters, Union Hill, N. J.—"Astral oil." Flashes at 99° F.; sells at 13 cents per gallon.

No. 12. Grocer, Moses Blank, Hoboken.—"Astral oil." Flashes at 100.5° F.; wholesale dealer, J. Donnelly & Co., Jersey City.

I could give you a large number of these tests, but they show about the same as the above, viz: that the "Amber oil" is not suited for use with a flashing point averaging 90° F., and should be excluded; that the "White oil" stands practically the test of 100° flash, though in a few instances 97°. Every grocer selling "Amber oil" has been notified that his oil is below standard, and not to sell it any more; if found doing so, suit will be commenced at once.

The amount of work required to inspect this district (Essex, Hudson, Middlesex and Union counties, the most populous in the State,) is great, and in Jersey City and Newark large quantities of this "Amber oil" are being sold, and no doubt also in other cities not yet inspected. *Personal inspection* is the only method by which poor oil can be driven out of the market. In Jersey City and Hoboken there are 708 grocers, and in Newark over 1,000 grocers, and as no attention is paid to circulars of the law sent by mail, I have found that the only method is as above stated, taking a sample of the oil personally and notifying the grocer of the result. In no instance can "Amber oil" be purchased now where I have tested the oil and informed the grocer of his liability to a $500 fine.

REPORT OF SHIPPEN WALLACE, ANALYST.

As one of the analysts appointed by you, I have the past year examined a large number of samples of kerosene, a number at the solicitation of individual sellers and users, a larger number obtained by me or at my suggestion. Of articles of food, I have had brought to me three samples of sugar, which proved, on analysis, to be adulterated with grape sugar. I have also had ten samples of "spices," which proved to be adulterated. The price at which they were sold indicated that they could not be pure. The analyses of milk which I made, according to the resolution passed at the meeting last fall, you already have my report of.

The samples of oil which I have tested represent, I think, the quality sold and used in this end of the State. They were mostly under the legal standard of 100°, but not to the extent I had expected to find. Quite a large quantity sold is 112° fire test, Pennsylvania. This oil will not be more, by my experience, than 92°–95°, New Jersey standard of 100° flash. One reason of its sale is that it is a few cents cheaper than higher-testing oil, and some persons claim, erroneously, that it gives a more brilliant light.

I have not found the law to be carried out by dealers in the matter of details as to labels, &c., in fact, a great many claim ignorance of there being any law on the subject. I have found that the sale of oil which is intended for use in lamps, and which is substantially naphtha under another name, such as "Genii oil," &c., has decreased to a very great extent. I know of two persons who continue to sell it, although informed that they render themselves liable to the penalties of the law. We may yet need to prosecute them.

I have a record of fifty-eight samples of kerosene tested, but a number I made no record of, knowing at the time that I had already examined the same dealers' oil a short time previously.

I append the temperature at which the oils flashed, with the instrument adopted by your Board being used. I do not embrace the naphtha samples, which burned at the ordinary temperature, and of which, as I stated, I found two persons selling for use in lamps.

Temperature of oil at flashing	85°–90°	90°–95°	95°–100°	100 and over.
Number of samples	9	22	10	17

REPORT OF WM. K. NEWTON, M.D., ANALYST.

Kerosene Oil.—Sixty-one samples of illuminating oil, from various parts of the State, have been tested during the past year. Some of these samples were collected by myself, while others were sent me for examination.

Of the sixty-one samples tested, only five were below the standard, and, when notified, the dealers stopped the sale of this quality of oil.

The oil law has undoubtedly done much good, and that without expense to the State. The work has been done quietly but effectually.

Milk.—I was directed by your Board to obtain samples of pure milk, and submit them for analysis to the Public Analysts of this State, with the view of testing the State standard fixed by the milk adulteration law, to see if such a limit would do injustice to any producer.

I beg to report that I have attended to your instructions as follows:

Eight samples of pure commercial milk—that is, the mixed milk of more than one cow—were collected in West Jersey, and submitted to Shippen Wallace, Esq.

Eight samples were collected in Hunterdon county, and were submitted to Professors Leeds and Cornwall, duplicates being sent to each.

Nos. 616, 617, 618, dairy of Pickles & Brothers.
615, 619, dairy of P. Voorhees.
614, 620, dairy of G. A. Clum.
472, dairy of J. N. Pidcock; sent to Prof. Cornwall only.
373, dairy of J. N. Pidcock; sent to Prof. Leeds only.

The duplicate samples were to be analyzed as follows:

Prof. Leeds was to follow the Ritthausen process; Prof. Cornwall the Cairns process. This was to be done with the view of testing the methods, to see if concordant results could be obtained by two chemists working on the same sample, but with different methods.

Mr. Wallace, in his samples from other sources, followed the almost universally accepted method of Wauklyn.

SPECIMEN ANALYSES OF MILK AND METHODS.

BY MESSRS. LEEDS, CORNWALL AND WALLACE.

Analyses of eight samples of commercial milk from Hunterdon county, collected by the State Inspector of Milk, and received December 5th.

METHODS OF ANALYSIS.

Determination of Water.—5cc. of milk are weighed in a platinum capsule, coagulated by absolute alcohol, evaporated on a water-bath, brought to constant weight in an air-bath at 105°. (100° C. is not high enough; at 110° there is sometimes partial caramelizing, and therefore 105° is adopted as a satisfactory mean).

Total Solids.—Heat the residue first gently, then at low red-heat until completely incinerated; cool in desiccator and weigh.

Albuminoids and Fat.—10cc. of milk are weighed in a beaker, 100cc. of water added, the albuminoids precipitated by standard solution of copper sulphate, and the supernatant liquid exactly neutralized by standard solution of potash. After filtration and proper washing, the precipitate is dried by opening out the filter-paper on a glass plate and careful manipulation. It is then completely exhausted of fat by allowing it to swim for two hours in ether while properly supported in the filter-paper, enclosed within a funnel under a return-cooler. The ether is collected in a small weighed flask, and, after distillation, the fat is left behind and weighed. The albuminoids are determined by igniting the albuminates of copper, left behind after extraction of the fat.

Sugar.—In the aqueous filtrate from the albuminates and fat, sugar is determined by Fehling's solution.

After having employed for several years the older methods, I have adopted those above stated as being not more tedious than those usually followed, and much more accurate. They render it possible to make a complete analysis of milk in which the sum of the several constituents found should equal the amount of total solids, and thereby afford to that extent a proof of the accuracy of each step of analysis. Moreover, the methods have the elegance and precision of an assay for gold or silver, and I am quite sure that no one who has familiarized himself with them will willingly return to the older methods.

SAMPLE NO. 373.—DAIRY OF J. N. PIDCOCK, WHITE HOUSE.

Specific gravity			1.0288
Water		85.43	per cent.
Total solids		14.57	"
Fat	6.73		"
Sugar	4.02		"
Albuminoids	3.14		"
Ash	0.62		"
Sum		14.51	"

SAMPLE NO. 614.—DAIRY OF G. A. CLUM, WHITE HOUSE.

Specific gravity				1.032
Water		84.75	per cent.	
Total solids		15.25	"	
Fat	5.98		"	
Sugar	4.37		"	
Albuminoids	4.21		"	
Ash	0.56		"	
Sum		15.12	"	

SAMPLE NO. 615.—DAIRY OF PETER VOORHEES, WHITE HOUSE.

Specific gravity				1.0323
Water		86.56	per cent.	
Total solids		13.41	"	
Fat	3.66		"	
Sugar	4.33		"	
Albuminoids	4.68		"	
Ash	0.68		"	
Sum		13.35	"	

SAMPLE NO. 616.—DAIRY OF PICKLES & BROS., WHITE HOUSE.

Specific gravity				1.308
Water		87.14	per cent.	
Total solids		12.86	"	
Fat	4.87		"	
Sugar	4.07		"	
Albuminoids	3.38		"	
Ash	0.64		"	
Sum		12.96	"	

SAMPLE NO. 617.—DAIRY OF PICKLES & BROS., WHITE HOUSE.

Specific gravity				1.0315
Water		87.01	per cent.	
Total solids		12.99	"	
Fat	3.55		"	
Sugar	4.23		"	
Albuminoids	4.49		"	
Ash	0.53		"	
Sum		12.80	"	

SAMPLE NO. 618.—DAIRY OF PICKLES & BROS.

Specific gravity				1.0315
Water		86.85	per cent.	
Total solids		13.15	"	
Fat	4.03		"	
Sugar	4.24		"	
Albuminoids	4.03		"	
Ash	0.62		"	
Sum		12.92	"	

SAMPLE NO. 620.—DAIRY OF G. A CLUM.

Specific gravity			1.030
Water		82 93 per cent.	
Total solids		17.07 "	
Fat	8.10	"	
Sugar	4.28	"	
Albuminoids	3.90	"	
Ash	0 62	"	
Sum		16.90 "	

SAMPLE NO. 619.—DAIRY OF PETER VOORHEES.

Specific gravity			1.030
Water		86 61 per cent.	
Total solids		13.39 "	
Fat	5 26	"	
Sugar	3 93	"	
Albuminoids	3.65	"	
Ash	0.43	"	
Sum		13.27 "	

I have the pleasure to acknowledge, in the performance of these analyses, the cooperation of Dr. E. Everhart, Milk Inspector for Jersey City and Hoboken.

I enclose herewith my report on eight samples of milk received from Dr. Wm K Newton, about December 5th. All but the ash determinations were made as soon as the milk came to hand, the ash being determined at my leisure on the solids left after extraction of fat by Cairns' method. Cairns' method consists in weighing out five grammes of milk in a platinum dish, drying on water-bath; then in drying oven at 100° C., until the solids lose less than five milligrammes between two dryings, extending over half an hour. From the solids thus dried the fat is extracted by means of ether boiled with them in the dish, six separate portions of ether, of ten cubic centimeters each, being used. The ether is poured off each time (not through a filter) into a weighed beaker, evaporated at a gentle heat, the fat dried at 100° C., and weighed. The ash was determined by igniting the extracted solids in the dish at the lowest possible temperature, until free from carbon. The specific gravity was taken by weighing in a flask holding about twenty five cubic centimeters of water, at 60° F., the temperature of the milk being 60° F., at the time of weighing.

MIXED MILK.

No	ORIGIN OF SAMPLE.	Water.	Total Solids.	Fat.	Solids Not Fat.	Ash.	Sp Gr.
616	Dairy of Pickles & Bros., White House..	87.18	12.82	3.43	9.39	0.664	1 0303
617	" " " " ..	87.11	12.89	3.19	9 70	0.702	1 0313
618	" " " " ..	86.80	13.20	3.52	9.68	0.691	1.0299
615	" Peter Voorhees, " ..	86.80	13.20	3 43	9.77	0.703	1.0315
619	" " " " ..	86.56	13.44	3.74	9.70	0.693	1.0298
614	" G. A. Clum, " ..	84.83	15.17	5 17	10.00	0.721	1.0299
620	" " " " ..	83.39	16.61	6.08	10.53	0.750	1.0310
472	" J. N. Pidcock, " ..	85.55	14 45	4.73	9.72	0.691	1.0290

REPORT OF THE COMMITTEE OF PUBLIC ANALYSTS AND INSPECTORS OF THE STATE BOARD OF HEALTH.

BY PROF. A. R. LEEDS, CHAIRMAN.

HOBOKEN, January 17th, 1884.

E. M. Hunt, M.D., Secretary of the State Board of Health:

DEAR SIR—I transmit herewith the reports of the members of the Committee of Public Analysts and Inspectors, duly appointed by the State Board of Health. This committee was called together shortly after its appointment, and its members undertook to enforce in their several districts the provisions of the law concerning kerosene, to analyze the samples of milk condemned by the inspectors thereof, and to prosecute offenders against the law concerning the adulteration of food. I transmit herewith the reports of the analysts and inspectors.

The principal new feature of the work done during the past year has been the steps taken to carry into effect the provisions of the law concerning kerosene. The extension of the system of personal inspection, already begun with the most encouraging success, will result in the exclusion from the New Jersey market of oil below the standard prescribed by the State law.

From a valuable report by Prof. Cornwall, upon "Malt Beverages and their Adulterations," it will be seen that no adulterations were detected in a considerable number of samples of beer submitted to analysis, and in their percentage of alcohol they were of full strength. But safety to the consumer, and the proper standard of quality, are only to be secured by a system of constant oversight and inspection. The best interests of both manufacturer and consumer are most effectually served in this way.

malted barley with the addition of hops, the fermentation being induced by means of yeast.

The barley is steeped in water and then placed in heaps until the spontaneous rise in temperature has induced germination of the seed. At the proper time the vitality of the seed is destroyed by drying or roasting it, and the result is malt. The crushed malt is heated with water ("mashed"), and the infusion, or "wort," thus obtained is boiled with hops, and is then drawn off, rapidly cooled, and fermented with brewers' yeast in large vessels. Before the fermentation is entirely completed the yeast is removed and the beer put into casks, where it undergoes a very gradual after-fermentation.

During the malting process a portion of the starch of the grain is converted into malt sugar and dextrine, by the action of a nitrogenous compound, diastase, which forms at the same time. During the mashing the diastase acts on the remainder of the starch with a similar result. The hops impart to the finished beverage wholesome tonic properties, a pleasant and peculiar aroma and an agreeable bitter taste, while they also aid greatly in preserving it.

During the fermentation induced by the yeast the greater part of the sugar is almost always converted into alcohol and carbonic acid; minute quantities of organic acids are also formed. If an acetic acid or excessive lactic acid fermentation occurs, through mismanagement or use of improper materials, the result is a sour and unwholesome beverage, which is often entirely worthless.

From the above it will be seen that it is possible to make something like beer from any saccharine infusion capable of undergoing alcoholic fermentation, and hence substitutes for barley or for barley malt are often used. Starch-yielding cereals or other materials, such as wheat, maize, rice, potatoes and others, are employed, or various kinds of starch, since all of these can be converted into fermentable sugars. Grape sugar, or glucose, and other sugars are also directly employed. The barley malt is, however, less liable to undergo irregular changes during brewing, while some of the other cereals are particularly liable to lactic acid fermentation, and beers produced from glucose are more prone to acetous fermentation.

It is therefore very desirable that malt beverages brewed from anything except malted barley should receive distinctive names, although their use is very widely extended.

As regards the substitutes for hops, which will be enumerated later, it may be stated here that, while probably no decidedly poisonous ones

ing from 96° F. to 102° F., and selling for from fourteen to sixteen cents per gallon. The first oil, "Amber oil," does not come up to the test (100° F. flash) as required by law, and in every instance I could have commenced suit; but as many of the grocers had purchased this oil, not by flash test, but as 130° test, they evidently were not the proper parties to sue, but the wholesale dealers; and as this oil, in most cases, had been purchased before the law went into effect, I considered it better to notify each dealer personally of the new law, and by also leaving one of the circulars relating to the subject as issued by the State Board of Health. By this means all of the dealers in Hoboken, and part of Jersey City, have been notified, and have more or less complied with the law by refusing to purchase or sell any oil except "White oil," standing a test of 100° F flash. Nearly all the first class grocers refuse to sell the "Amber oil," as the margin of profit is small and the risk of $500 fine too great; and the cases where I have found the "Amber oil" sold are among the grocers supplying the poorer classes of the population. It would seem to be unfair to sue these grocers, but it would be just and right to make the wholesale dealers and refiners of the oils responsible. Not only this, but the actual "flash test," not "fire test," should be upon each barrel as sold. Most all the oil is sold as 150° F. "fire test," and, as the fire test has no relation to the "flash" test, the grocer has no remedy against the dealer of whom he purchases.

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No. 3. From Messrs. Gardner & Dudley, Orange, N. J.—"Amber oil." Flashes at 85° F.

No. 6. Grocer, Woltjen Bros., Fourth and Bloomfield streets, Hoboken.—"Astral oil." Flashes at 97° F.; wholesale dealer, E. A. Brockwedel, corner Harrison and Hoboken avenues, selling price, 15 cents per gallon.

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No. 8. Grocer, Charles Booken, Second and Bloomfield streets, Hoboken.—"Amber oil." Flashes at 88° F.; wholesale dealer, Gouche, West and Bank streets, New York, selling price, 11 cents per gallon.

No. 9. Grocer, Charles Booken.—"Astral oil." Flashes at 98.5° F.; wholesale dealer, J. Donnelly & Co., Jersey City; selling price, 15 cents per gallon.

No. 10. Grocer, Woltjen Bros., Hoboken.—"Astral oil." Flashes at 99.5° F.

No. 11. Grocer, Winters, Union Hill, N. J.—"Astral oil." Flashes at 99° F.; sells at 13 cents per gallon.

No. 12. Grocer, Moses Blank, Hoboken.—"Astral oil." Flashes at 100.5° F.; wholesale dealer, J. Donnelly & Co., Jersey City.

I could give you a large number of these tests, but they show about the same as the above, viz.: that the "Amber oil" is not suited for use with a flashing point averaging 90° F., and should be excluded; that the "White oil" stands practically the test of 100° flash, though in a few instances 97°. Every grocer selling "Amber oil" has been notified that his oil is below standard, and not to sell it any more; if found doing so, suit will be commenced at once.

classes, and in this part of the country (Ratisbon) the enjoyment of a certain quantity of beer is necessary for the most humble daily laborer, and furnishes him also, in a certain sense, a means of nourishment." He adds: "As it at present often reaches the consumer, beer does not indeed deserve the name of a nourishing agent, since its adulterations are extraordinarily numerous and widely spread. Adulterations of beer may be divided into two classes—the use of improper means to improve deteriorated beer, and the substitution of cheaper materials for malt and hops."

Here it may be as well to state that the substitution of glucose for malt, while it may increase the amount of alcohol, lessens the nourishing power of the beer, because glucose yields none of the solid extract which is furnished in considerable quantity by malt.

In accordance with a request from the Board of Health of New Jersey, the writer has examined a number of samples of what is commonly known as lager beer, the samples being from various sources. Some were bottled beer, others ordinary beer, intended for immediate use. Two were samples of well-known and favorite brands. The examination was confined to a determination of the alcohol, solid extract and chlorides, together with a qualitative test for certain foreign bitter principles, mostly derived from the hop substitutes said to be most frequently employed.

Beer and malt liquors in general contain water, carbonic acid, alcohol (ethylic), malt sugar, dextrine, resinous and gummy matters, bitter extractive, albuminoids, small quantities of glycerine, lactic, acetic and succinic acids, and salts. The percentage of alcohol and of "extract," consisting principally of the sugar, dextrine, albuminoids, bitter principles and salts, affords a convenient means of comparing different kinds of malt liquors, and it will be found that the proportions of alcohol and extract vary considerably. When glucose or similar saccharine substances have been used, the beer, &c., will be deficient in extract.

Post gives the following as the characteristics of a good beer: A proper proportion of alcohol; a "natural" aroma, dependent on the use of hops; perfect clearness; a sparkling and sufficiently foamy appearance; sufficient viscosity (dependent on the nature and amount of the solid extract), and a refreshing, vinous, sweetly-bitter taste. The description will be recognized by connoisseurs as an accurate one.

The following table, from Post, shows approximately the percentages of alcohol and extract in various beers:

	Alcohol.	Extract.
Bavarian Lager Beer	3.1–3.9	4.0–4.6
Munich Bock	4.3–4 8	8.6–9.4
Vienna Lager Beer	2.7–4.4	4.0–8.0
Pilsen Lager Beer	3.4–4.6	4.8–5.7
Culmbacher Beer	4.2	4.6

Blyth (*Manual of Practical Chemistry*) gives the following table:

	Alcohol.	Malt Extract.
London Porter (Barclay & Perkins)	5.4	6.0
London Porter	6.9	6.8
Scotch Ale	8.5	10.9
Burton Ale	5.9	14.5

In the report of the State Board of Health of New York, for 1881–82, the average of nineteen samples of lager beer tested for the Board, was given as follows: Alcohol, 2.781 per cent. (highest, 4.14; lowest, 1.45); extractive matter, 6.047 (highest, 7.26; lowest, 4.58). As will be seen hereafter, in this article, the average percentage of alcohol in the ten samples tested for our State Board of Health was decidedly higher.

The complete analysis of beer is a complex operation, requiring the determination of specific gravity, carbonic acid, alcohol, total extract, sugar, dextrine, albuminoids, glycerine, degree of acidity (usually reported as lactic acid), ash, phosphoric acid and chlorides, together with tests for hop substitutes, alkalies or alkaline earths (used to correct acidity), glycerine, salicylic acid and other substances which may have been used to improve a deteriorated article or to preserve the beer.

As has been already stated, the tests for the present report were confined to a determination of the specific gravity, alcohol, extract and chlorides, with an examination for certain foreign bitter principles. The determination of the alcohol, extract and specific gravity furnish, together with the physical properties, smell and taste of the beer, important indications as to the quality of the latter and the probable use of malt substitutes.

The estimations of the alcohol and extract were made by Ballings' indirect method, as given by A. Schmidt, (*Archiv der Pharmacie*, 1878); the chlorine (being the measure of the salt and other chlorides present) was made as Blyth directs, by extracting the charred residue from seventy cubic centimeters of beer with water, filtering and estimating the chlorine in the filtrate by standard solution of silver nitrate.

These determinations were all made by Dr. L. W. McCay, in the laboratory of the John C. Green School of Science, at Princeton.

The English authorities consider any amount of chlorine corresponding to less than fifty grains of common salt per gallon as admissible, and in none of the samples did the salt exceed thirty grains, while in general it fell below ten. The method of estimating the alcohol and extract was as follows: After removing the carbonic acid from the beer by violently agitating it in a closed flask and passing air through the liquid, the specific gravity of the beer is taken; then 100 cubic centimeters is weighed in a porcelain dish, evaporated to one-third of its original volume, cooled and water added, until the first weight of dish and beer is again reached. The watery extract solution is then filtered, its specific gravity is taken, and, by means of proper tables, the percentage of extract corresponding to the observed specific gravity is obtained. By subtracting the specific gravity of the beer before evaporation from that after evaporation, and then subtracting this difference from 1.000 (the specific gravity of water), we obtain a figure representing the specific gravity of a dilute alcohol, equal in alcoholic strength to the beer.

Dr. McCay obtained the results given below:

Sample.	Specific Gravity.	Alcohol, Per Cent.	Extracts, Per Cent.
1	1.0155	4.11	5.6
2	1.0124	4.25	5.0
3	1.0093	3.52	4.4
4	1.0136	4.47	5.3
5	1.0188	4.64	6.7
6	1.0227	4.29	7.5
7	1.0175	5.16	6.5
8	1.0265	4.58	8.6
9	1.0191	3.94	6.5
10	1.0153	3.88	5.5
Average..	....	4.284	6.16

As a check on the alcohol determination, the writer made two direct determinations by distilling the alcohol from the beer (neutralized with caustic baryta), and determining the specific gravity of the alcoholic distillate. This was done in the case of two of the beers, Nos. 5 and 8, and he obtained for these respectively, 4.55 and 4.29 per cent. of alcohol. The indirect method, according to Schmidt's examples, is apt to give results a little too high, but it is certain that all of the above beers were of full strength. They exhibit no abnormal proportions of alcohol and extract, as compared with published

analyses of German lager beers, but it is not impossible that some of them may owe a part of their alcohol to the use of glucose or similar saccharine substances.

No. 17 contained chlorine equivalent to nearly thirty grains of salt per gallon.

Several of them were not perfectly clear, which is always a sign of some defect, and one had an unpleasant odor. One had an unusually sweet taste, and it could be said of only a small proportion of them that they were really perfect beers, although, with the exception of the one that had a disagreeable odor, it could not be said that any of them were manifestly unwholesome.

The writer subjected all of the above samples to a thorough test for the following foreign bitter principles, which includes the greater number, according to Schmidt, of such substances as exist in the hop substitutes which are believed, with more or less reason, to have been used: Aloes, buckbean, gentian, willow bark, colchicum, colocynth, *cocculus indicus, nux vomica,* quassia, wormwood and picric acid. The method employed was Wittstein's, as modified by A. Schmidt (*loc. cit.*) A brief description of it is here given.

A liter of the beer is concentrated to a syrup, and this is thoroughly extracted twice with alcohol of about ninety-four per cent., the alcohol is filtered, evaporated and the residual syrup specially tested as follows:

1. A little of it is diluted with three parts of water, and a bit of white woolen yarn left in it for an hour. If the yarn, after thorough washing in water, is yellow, picric acid may be present. To prove this, the wool is extracted with ammonia, the solution evaporated to a trifling residue and treated with a few drops of solution of cyanide of potassium. The least quantity of picric acid will then produce a red color of potassium isopurpurate.

2. The greater part of the syrup is shaken with six parts of benzol, the treatment is repeated with fresh benzol, and the two benzol extracts evaporated by gentle heating. The residue may contain, besides hop bitters, strychnin, brucin, colocynthin, colchicin and traces of aloëtin (the latter being disregarded). The residue is divided into three parts, one being treated with pure sulphuric acid, another with nitric acid of sp. gr. 1.33–1.4, and the third with sulphuric acid and a little grain of potassium bichromate. Colocynthin would be indicated by a red color caused by the sulphuric acid alone; brucin by a

red color caused by the nitric acid; colchicin by a violet color with this acid; strychnin by a blue or violet color, rapidly changing to red, under treatment with the sulphuric acid and bichromate of potassium.

3. The residue just shaken with benzol is freed from the small residue of this by gentle warming, and is then shaken with amylic alcohol, which may take up picrotoxin, aloin or salicin, and only in such case will taste bitter. A portion of it is evaporated at the ordinary temperature on a glass plate, when picrotoxin would be shown by delicate, white crystalline formations. The remainder is divided into two portions, to one of which caustic potash solution is added, when the presence of aloes would cause a fine purple-red solution, while the characteristic odor of aloes would also be noticed. The remainder is best tested for salicin by adding sulphuric acid, a small grain of potassium bichromate and a few drops of water, and warming the mixture to obtain the characteristic odor of salicylous acid (salicylal).

4. The residue, which has been shaken with benzol and amylic alcohol, is freed from the latter by means of blotting paper and shaken with absolute ether. This dissolves the hop bitter and any absinthin present. The ether is evaporated, and the use of absinth detected by the characteristic wormwood odor, as also by the fact that sulphuric acid would yield with it a yellowish-brown color, quickly changing to violet-blue, and hydrochloric acid (1.135 sp. gr.) would give a green color, changing to fine blue.

5. In the residue which has been shaken with ether, tests are made for the characteristic constituents of buckbean, quassia and gentian, provided it still has a decidedly bitter taste. The residue is freed from ether, dissolved in a little water, filtered if necessary, and a part warmed with dilute sulphuric acid. The characteristic odor of menyanthol would indicate that buckbean had been used. Another part is heated with a strongly ammoniacal silver solution. Should a silver mirror form, menyanthin or gentipicrin would be indicated (in the latter case the treatment with sulphuric acid would yield no characteristic odor.) If quassia is present, no reduction of silver ensues. Dragendorff does not regard the detection of gentian as certain.

None of the samples of beer tested by the writer gave any indication of the presence of anything not normal to beer. The residues from the various operations gave none of the characteristic reactions mentioned above for foreign bitter principles, while scarcely any difference in taste, odor or behavior of the residues could be detected.

It would appear, from the tests here recorded, that at the present time the use of any substitute for hops cannot be very extensive, and also that at least a very fair proportion of malt is commonly used in the brewing of even common lager beer.

In view of the fact that different opinions often prevail, it may be well here to present statements of various authorities as to the adulterations of malt liquors said to have been detected. It will be seen that in many cases, more especially as to the alleged use of poisonous bitter principles, opinions differ.

A. Almen (*Archiv der Pharmacie*, 1879,) states that in the course of investigations in Sweden, in 1871, foreign bitter principles were not uncommonly found in beers, and specifies quassia, menyanthin or a closely related principle, and absinthin. He adds that of late years such adulterations have been very rarely detected, and thinks that there has been for the most part an unwarranted fear that injurious hop substitutes are used.

Dragendorff (*Ermittelung von Giften*) says that foreign bitter principles are not seldom added to beer to lessen the consumption of hops. "Such an addition is an imposition on the public, which is not to be lightly regarded, *hops being employed not for their bitterness alone*, and it is the duty of the government to take cognizance of such proceedings."

Stillé and Maisch (*National Dispensatory*) state that *cocculus indicus* is said to prevent the secondary fermentation of liquors, and for this purpose it is sometimes added to malt liquors at the risk of poisoning those who drink them.

Hassell (*Food, its Adulterations, &c.,*) reports that Phillips found that *cocculus indicus* had been used in the case of two out of twenty samples of adulterated beer, and that tobacco had been used in one. (These were tested some years ago.)

Blyth (*Manual of Practical Chemistry*) states that the bitter principles of beer are occasionally derived solely from the hop, but are very commonly supplemented by so-called hop substitutes, and adds that samples of these all contained quassia, while portions of the following plants were identified: calumba, chirata, gentian and wormwood. He also states that picric acid has certainly been discovered, and picrotoxin is strongly suspected.

Post (*Grundriss der Chemischen Technologie*) says that, as unauthorized hop substitutes, other plants have, in a few isolated instances, been used: wormwood, quassia, buckbean, colchicum, &c.

Parkes (*Practical Hygiene*) gives the following list of deleterious substances whose use in liquors is forbidden by the Licensing Act (England) of 1872: *cocculus indicus*, salt, copperas, opium, Indian hemp, strychnin, tobacco, darnel seed, extract of logwood, salts of zinc or lead, alum and any other extract or compound of any of the above ingredients. It will be observed that many of the substances already mentioned are not included in this list. Parkes also enumerates the following among other adulterants that are used: sulphuric acid, to "age" the beer; a mixture of alum, salt and copperas, to "head" it; carminatives, as capsicum and grains of paradise, to give it pungency. He does not consider the use of *cocculus indicus* as proven.

Wittstein, (*Archiv der Pharmacie*, 1875,) after enumerating the bitter principles already referred to in the description of Schmidt's process for their detection, given in this report, says all the plants containing them, or else the bitter principles themselves, are so marked in their nature that smaller quantities of them will replace the hop, so far as bitterness is concerned, but they cannot afford the aroma nor the tannin and hop resin so important in making beer. He classifies buckbean, gentian, wormwood and quassia among the innocuous substitutes; aloes and colocynth are more dangerous on account of their purging properties. Colchicum, *cocculus indicus*, *nux vomica* and picric acid are absolutely poisonous, but he says that, so far as he knows, none of them have ever been certainly detected, possibly on account of imperfect methods of analysis, or because they were not present in the beers examined. The methods have been much improved of late, but nevertheless in many cases these foreign substances will be vainly sought for, both because they are not used so commonly as is believed and because only a very high price of hops would lead a brewer to employ other materials, which not only fail to produce so good and lasting a beer, but would often cause suspicion by the nature of the beer brewed with them. The fact that more *cocculus indicus* is imported into Germany than can be used as medicine, he thinks may be largely explained by its use as a vermin exterminator or as a means of paralyzing and thus catching fish. At the same time, Wittstein expressly states that he does not mean to intimate that this and other hop substitutes are not used, and he proceeds to give a method for their detection.

A. Schmidt (*loc. cit.*) admits that poisonous foreign bitter principles may have been found in beer, but far less frequently than is sup-

posed; indeed, he regards it as a highly improbable thing that opium, tobacco, *nux vomica* or other poisons should be used in Germany. Good methods exist for the detection at least of the presence of some foreign bitter principles, even if it is not always possible to assert just which one it may be.

There seems to be no reason to doubt that foreign bitter principles, not altogether harmless, are sometimes used in brewing the commoner grades of malt liquors, but probably only when hops are high-priced, and also probably by no means so commonly as is often supposed. If a beer has an intensely bitter taste, or one that persists long in the mouth, the presence of foreign bitters may be suspected, and the writer well remembers a glass of ale which produced, not many years ago, so lasting and intensely bitter a taste in his mouth as to excite not only surprise but apprehension. It was unquestionably not hop bitter, although no evil results followed.

Malt liquors are of sufficient importance to warrant a public oversight of their manufacture and sale, in the interests of public health. The use of hurtful hop substitutes, of ingredients for concealing the defects of such beverages, and the addition, by retailers, of water to increase their quantity, should all be rendered dangerous to brewers and dealers. In the interests both of health and temperance, mild malt liquors should be removed from suspicion of injurious properties.

REPORT OF THE MILK INSPECTOR.

WM. K. NEWTON, M.D., PATERSON, N. J.

Ezra M. Hunt, M.D., Secretary State Board of Health.

SIR—I hand you herewith my fourth annual report.

An act was passed by the last session of the Legislature, so amending the milk law that all tests should be made at the station from which the milk should be shipped.

The law in force, states that no complaint shall be made until the suspected milk shall have been analyzed, hence, to require such a test or analysis to be made at the shipping point, would practically stop all the work of inspection, and render the statute inoperative; a result probably not desired by the advocates of the amendment.

The attention of Governor Ludlow was called to this, and other inconsistencies in the amendment, and he withheld his signature.

Upon the earnest solicitation of producers in the northern and western sections of the State, a law was enacted prohibiting the sale of skimmed milk, but this was made applicable to cities of the first class only, to wit, Newark and Jersey City.

The utility of such a special law may well be questioned, for if it be wrong to sell impoverished milk in cities of the first class, why is it not wrong or impolitic to sell it in cities of the second or third class? As an example of this inconsistency, we may state that while the sale of skimmed milk is forbidden in Jersey City, it may be disposed of across the city line in Hoboken.

The law to prevent the sale of impure milk has worked exceedingly well this year, and it is to be hoped that the Legislature will refuse to sanction any attempt to alter or weaken it, especially so, when it is now known that the law has been declared to be constitutional by the Supreme Court, and needs only careful administration to insure justice to all.

The work during the past year has been energetically pushed forward, and, by the appointment of assistants, nearly every portion of the State has been brought under the operation of the law.

The State was divided into sections, and three assistants were appointed.

Dr. Edgar Everhart, of Stevens Institute, Hoboken, has had charge of the work of local inspection in Hoboken and Jersey City, this being his second year, and he has accomplished excellent results. The local supply of these cities is now in a very fair condition.

Seventeen complaints were made by him against persons violating the law. These were disposed of as follows: Six were fined $50 each; one person had his penalty

remitted on account of mitigating circumstances; one paid part of his fine, and then left the State, and nine were fined, but appealed their cases to higher courts.

Dr. Everhart is paid a small salary by the State.

Thomas B. Rogers, D.V.S., of Westville, Gloucester county, has inspected in the southern and western portions of the State, including the seaside resorts therein situated. The milk supply of Camden, Millville, Gloucester, Atlantic City, Cape May, Ocean City, and other places, has received his constant attention. Besides this work, he has visited a large number of dairy farms, noting the condition of the cattle and their surroundings, and making comparisons of the quality of the milk as produced, with that which is sold in our cities and towns. He, being a veterinarian, was able to make valuable investigations into the sanitary condition of milch cows, and, as a result of his experience, expresses the opinion that the work of the inspector should extend beyond the mere testing of milk to detect adulteration, and should embrace the surveillance of the herd. This opinion endorses what I have for a long time claimed, that notice should be taken of the health of the cows from which we obtain milk, and that all milk produced by animals out of health, should be kept out of our markets.

The result of Dr. Rogers' work has been very encouraging in that it has bettered the quality of the milk sold in the southern and western part of the State. Dr. Rogers was paid a small salary, a portion of which was allowed by the State, the remainder and his traveling expenses being paid by me.

Mr. Peter L. Vandegrift, of Burlington, was engaged for the work of inspection in Burlington county and the adjacent dairy sections. He has proved himself a most excellent officer, being always courteous and pleasant, and, furthermore, being possessed of that very commendable virtue, so necessary in this work, namely, reticence. Mr. Vandegrift has inspected the milk shipped from Kinkora, Columbus, Mt. Holly, Burlington and Jobstown, also the milk in the wagons at Bordentown, White Hill, Florence, Mt. Holly and Burlington. He has kept a record of each inspection, noting in a book the temperature and lactometer reading, and, according to instructions, has taken a sample of every can of milk falling below the specific gravity, 1.029, this being done for the purpose of having an analysis made. At first many samples were taken, but as the work of inspection went on the quality of the milk was bettered, so that at a recent inspection he failed to find any below the standard. In one instance, at Kinkora, the total solids went up from 10.50 per cent. to 13.62 per cent. as a result of the watchfulness of the inspector. No expense was incurred to the State by Mr. Vandegrift.

At Newark, Paterson and Vineland the local authorities have had charge of the work of inspection without expense to the State.

In Newark, Mr. Henry Negles, a competent and conscientious inspector, has done well and merits the earnest support of the city government. The complaints in this city have been made under the food adulteration law, as the city attorney did not deem the milk law sufficient for the purpose.

At Vineland we have an example of what can be accomplished, in the way of regulating the milk-supply, by an earnest Health Board. In this town the quality of the milk sold has been kept excellent by the constant surveillance of the members of the Board, and work has not only been well done but without expense.

Personally, I have attended to those portions of the State not embraced in the above statement. The dairy sections in the counties of Sussex, Morris, Essex, Hunterdon, Passaic, Warren and Middlesex have been frequently visited and the milk

there produced tested. It is encouraging to note that never before has the milk produced and sold in the State been of such general excellence, and the work of four years has just begun to bear fruit.

The past year has been an extremely busy one and more efficient work has been done than ever before. Besides the inspection of milk I have collected many samples of pure milk, for the purpose of testing the standard adopted by the State, the result of which work will be stated further on.

After some five years of practical experience in this line of sanitary work, I am able to say that the addition of water and the abstraction of cream comprise about all the methods employed for the purpose of adulterating or impoverishing milk. In some sections of the State, notably Atlantic City and other seaside resorts, a few dealers have been in the habit of adding preservatives, such as boric acid, sodium biborate and alkaline carbonates, but this practice has been checked. One case where annatto had been added was reported by Dr. Rogers. From many experimental tests made of milk thus treated we are now able to detect very accurately all such such adulterations.

In my last report I mentioned that some cases, where complaints had been made for violations of the law, remained undecided. Of these I shall refer to three which have been settled by the Supreme Court.

In August, 1882, complaints were made at Camden, against three persons for selling milk adulterated with water. After many delays the trials took place in January, 1883, resulting in a conviction, and a penalty of $50 was imposed in each case. The defendants, feeling aggrieved at the action of the court and being informed by their lawyer that the law was not constitutional, took their cases on a writ of *certiorari* to the Supreme Court in February of this year. The argument of counsel was heard at the June term and a decision given by the court in November, 1883.

Charles V. D. Joline, Esq., of Camden, appeared as my attorney, prepared the brief and made the argument in my favor. The decision was prepared by Justice Reed, was concurred in by the court and in the main endorses the law. As this decision affects the Public Health Laws of the State, I shall quote the principal features. The Food Adulteration Law, the Milk Adulteration Law and the Health Laws all provide for a method of summary proceedings, for it is argued that if a nuisance, source of foulness, impure food or bad meat, is injurious to the public health the danger must be removed without loss of time; protracted suits would, in a measure, permit harm to be done, hence rapid action is provided by law.

The reasons presented by the prosecutors of the writ for asking the Supreme Court to decide that the law was not constitutional, are as follows: 1st. That it embraces two objects instead of one. 2d. That it provides for the arbitrary divestiture of the property of the citizen without due process of law. 3d. That it is a judicial act, deciding upon the character and admissibility of testimony. 4th. That it adjudges a forfeiture of the rights and property of the citizen without a judicial hearing and judgment, without due notice, and without a trial by jury.

In regard to the first point, the court says:

"That the design of the Legislature is single, namely, to secure the sale of wholesome milk. The second section of the act provides for the punishment of those who shall sell, or offer for sale, &c., any impure, adulterated or unwholesome milk. It further provides for the punishment of those who shall adulterate milk, or who shall keep cows in a crowded or unhealthy condition, or feed the same on food that produces impure, diseased or unwholesome milk, or shall feed cows on anything of an unwhole-

some nature. * * * The third section declares that the addition of water or any other substance is an adulteration; and milk that is obtained from animals that are fed on unwholesome food, or milk that has been exposed to the emanations from a person sick with any contagious disease, is impure. This is all directed against the production and sale of impure milk. * * * The subsequent sections, fixing the legal standard to which all milk shall be subjected by analysis, fixing the penalties to be imposed, directing the method of procedure in prosecutions for violation, and establishing the duties of the public analyst and of the State Inspector, are details appropriately directed to the execution of the single design intended to be secured by the legislation. Upon inspection of the body of the statute, no incongruous subjects are intermingled within the purview of the constitutional interdiction. * * * There is a difficulty, however, arising from the manner in which the act is entitled. * * * The perplexity springs from the inaccurate particularity by which, in the title, the scope of the legislation is expressed. * * * The constitution does not require a detailed, but a general expression of the scope of the enactment, and the danger of attempting to specialize the minutiæ of the legislation is apparent when, as in this act, there is at least one prohibition, which is clearly beyond the object indicated by the title, while clearly within the general object of the legislation. * * * The title is 'An act to prevent the adulteration and to regulate the sale of milk.' * * *

"Adulteration means to debase by the admixture of foreign materials. This is not only the literary significance of the word, but its meaning, also, is defined by the statute itself. * * * The distinction is drawn with clear lines between adulteration and impure and unwholesome milk. * * *

"The prohibition in the second section of the act is aimed at both the adulteration and the production of unwholesome milk by other methods. * * * It is not limited to the sale of adulterated or impure milk, or the having possession, with intent to sell, but is also directed at the act of adulteration, and the act of producing, by other methods, unwholesome milk. * * * The latter prohibition is, in my judgment, clearly outside of the object of the legislation as expressed by the title. As to the remaining parts of the statute, I think they are covered by the title. The regulation of the sale of milk is a general, but a sufficient expression of the enactment of all the guards thrown by this act around the vending of an article of daily consumption. The provision for inspecting it, the prohibition against selling it, if impure or under a certain standard, is within the general notion expressed by the terms regulating its sale. * * *

"And so, also, the having possession of this quality of milk, with an intent to sell, is equally within the power of legislative interdiction under this title. The offensive part of the prohibited act is the intent to sell, the design to perpetrate the act, the regulation of which is the expressed object of the legislation. * * * The presence of the prohibition, already stated as foreign to the title, upon a well settled rule of constitutional construction, does not vitiate the remaining portion of the act. * * * It can be eliminated from the act, leaving the residue of the act operative; and it is within the valid provisions of the act, that the prohibition upon which these prosecutions are grounded, is found. * * *

"The second branch of the constitutional objection to the statute is grounded upon the provisions of the 9th section, which empowers the milk inspector, in case he shall upon inspection find any milk which has been adulterated, to condemn the same and pour it upon the ground, etc. * * * This portion of the act is not involved in the present proceedings, * * * but as the objection has been elaborately argued it may be of use to remark that this clause does not seem obnoxious to the criticism to which it has been subjected. * * * That the title to all private property is held subject to the paramount consideration of the public health and safety of the entire public, is too well settled for discussion. It is equally well established that the authority inherent in the State under the title of police power, enables the Legislature to fix upon certain kinds of property, or upon the manner in which property is used, the brand of noxiousness to public safety and health. * * * And when the character of a nuisance has been so affixed, it is a frequent exercise of legislative power, in addition to the visitation of a penalty to be recovered by action or imprisonment upon conviction under indictment, to also provide for the abatement of the nuisance itself by means of a seizure and destruction of the property itself. * * * The exercise of the power is illustrated

by the numerous statutes in other States, which have received judicial sanction; among others those providing for the seizure and destruction of liquors, the arrest and sale of straying animals, the impounding and destruction of dogs and for the seizure and destruction of illegally baked bread. *Sedg. Stat. and Const. Law*, 434 note 455 note. * * *

"In the case of *Wells* v. *Snover*, 13 *Vt.* 341, this court sanctions the act of a fish warden in destroying a fish basket by virtue of the act of 1871 (*Rev. p.* 443), and the sanction is put upon the ground of the right to authorize an officer to abate a nuisance. * * *

In the section of the act now under inspection, the authority of the officer to destroy rests upon the fact of adulteration or impurity of the milk, and the section further provides that if a subsequent analysis shall disclose the fact that the officer was mistaken in the result of his examination the owner is to be paid the value of the article destroyed. * * *

"The next constitutional objection is leveled at the provisions contained in the 4th and 8th sections of the act."

The 4th section provides that if the milk shall be shown, upon analysis by a member of the Council of Public Analysts or the chemist of the State Experiment Station, to contain less than twelve per cent. of milk solids, it shall be deemed to be adulterated.

The Court goes on to say:

"The objection raised against this section consists in the force which it is alleged is given to the analysis of the analyst. The contention is that the result reached by the chemist is, by force of the act, made conclusive evidence of the guilt of the defendant, and that such an exertion of power is beyond the ability of the Legislature. * * * In interpreting the significance of this clause, I think it is obvious that its design is to include within the kind of prohibited milk such as shall not possess a certain standard of excellence. I think the standard so fixed was not intended to mark the absolute line between pure and diluted milk. The placing of the standard was to set up a mark to indicate where, in the judgment of the Legislature, the salubrity or full commercial value of milk ceased to exist. The section does not mean that the result of the analysis shall be conclusive evidence that the milk has in fact been adulterated, but it does mean that milk below a certain standard shall not be sold; therefore, when analysis discloses that condition it shall be, for the purposes of that act considered adulterated, so that by force of the other section it thereby becomes prohibited. * * *

In the State of Massachusetts, their act relative to the inspection of milk contains a clause similar to the one now in question, the difference being that ours provides for an analysis by a State officer, and theirs does not name the persons who make the analysis. The Supreme Court of that State in the case of *The Commonwealth* v. *Evans*, 132 *Mass.* 11, held that this legislation was constitutional, and belonged to the class of police regulations designed to prevent frauds and protect the health of the people. * * *

"The clause as contained in the Massachusetts statute is also found in the statutes of Rhode Island. In construing it in the recent case of *The State of Rhode Island* v. *Smith*, it was held that this clause was not intended as a rule of evidence, but defined a new offense. * * * I think the Legislature was not opposed to any fundamental or constitutional restriction."

As to section 8, where it says that the certificate of an analyst shall be taken as *prima facie* evidence, the court holds that this is objectionable, but that as the chemist in the case under review, was examined in person, no constitutional objection can be urged in this particular case.

The last of the objections is that the act makes no provision for a trial by jury. The Court says: "The law has so frequently been stated to the effect that the enforcement of regulations of the kind included within the statute by summary proceedings, before a magistrate alone, was not within the constitutional guaranty of trial by jury, that I think further remark would be profitless."

In deciding upon the complaints made in the cases under review, the court decides that they were defective, because no mention was made of the results of the analysis, and says that a valid complaint should include this fact, and the name of the analyst who made such an analysis. It is also held that all that is necessary is to prove that a certain sample of milk failed to come up to the standard fixed by the statute, and a complaint stating this, together with the name of the chemist, would constitute a true complaint of a violation of the law.

REVIEW OF THE FOUR YEARS' WORK

It will be profitable and interesting to review the work done under the act to prevent the sale of impure milk during the past four years, and to note the results of its enforcement.

We shall note these results under two heads: first, from a commercial standpoint; secondly, from the sanitary bearings of the law.

The commercial relations of the law.—It may be remembered that, primarily, the law to regulate the sale of milk was enacted to protect our farmers from the injurious effects due to the sale of impure and impoverished milk, and was intended to enable them to obtain better prices for their commodity, by reducing the quantity of impure milk put upon the market.

When the question was first agitated, in 1879, the farmers in Sussex, Hunterdon, Morris, Essex and Union counties were only able to obtain extremely low prices, barely equal to the cost of production. Not only was the price kept down, but the market was flooded with skimmed milk by the many creameries in this and New York State, the tendency of which was to maintain a surplus in the market, and reduce the price obtainable for pure milk. It was important, then, to reduce the amount of impure milk offered for sale, and thus to increase the demand for a strictly pure article. For this purpose the law was framed, and we shall now see whether the end sought for has been attained.

It was the custom, heretofore, for the dealers in New York City to dictate to the farmers the price to be paid. This was done from six months to a year in advance, and the producer was rarely consulted as to the terms, the price having little to do with the ratio of supply and demand. Thus, in 1879, a scale of prices was fixed, allowing twenty-eight cents a quart on the yearly basis; that is, when the monthly rates were added together, an annual rate of twenty eight cents was obtained. This will be explained further on. It was when these low figures prevailed that the attempt was made to get some protection from the State, so that poor milk should be driven from the market, thus increasing the demand for a good article, and establishing a better scale of prices.

The first milk law under which an inspector was appointed, was enacted in the early part of 1880, and when this law took effect and the work of inspection began, thus reducing the quantity of impure milk offered for sale, the yearly rate advanced to thirty four and one half cents a quart.

It is easy to calculate the effect of this advance in price upon the receipts obtained by farmers from the sale of milk.

I give in the following table, the monthly and yearly prices, also the amount obtained from the sale of one forty-quart can of milk each year, and the gradual increment will be noticed.

PRICE PAID EACH MONTH, PER QUART.

	1879.	1880.	1881.	1882.	1883.
January	2½ cents.	3 cents.	3½ cents.	4 cents.	4 cents.
February	2½ "	3 "	3 "	4 "	3 "
March	2½ "	3 "	3 "	3 "	3¼ "
April	2 "	2½ "	2¾ "	3 "	3 "
May	2 "	2 "	2 "	2½ "	2½ "
June	2 "	2 "	2 "	2½ "	2½ "
July	2 "	2½ "	2 "	2½ "	3 "
August	2 "	2½ "	2½ "	3 "	3 "
September	2 "	3 "	3 "	3½ "	3½ "
October	2½ "	3 "	4 "	3½ "	3¼ "
November	3 "	4 "	4 "	3½ "	4 "
December	3 "	4 "	4 "	4 "	4 "
Yearly average	28 cents.	34½ cents.	35¾ cents.	39 cents.	39 cents.
Price obtained for each 40-quart can.	$340.60	$119.60	$135 00	$474.80	$174 80

It will be observed that there is a difference between the price obtained for a can of milk in 1879, and that for 1883, of $134.20, in favor of the farmer. The amount of benefit derived by the producers of Sussex, Hunterdon, Essex, Union, Morris and Middlesex counties may be roughly estimated when it is known that not less than 414,000 cans of milk are sold each year by the farmers of these counties. While I do not claim that this increase in value is due wholly to the protection afforded by the law, I do assert that without this law but little would have been accomplished in the way of establishing better prices.

The law has also enabled the producers, in the above-mentioned counties, to effect an organization for the purpose of controlling the trade and compelling dealers in New York city to pay more equitable prices. In the revolt against dictation by dealers (which occurred in the winter of 1882–3, and was popularly known as the "milk strike,") great assistance was rendered by the law, through the inspector, and by the New York inspectors, in the way of keeping impoverished milk off the market. The victory for the farmers which ensued not only gave them control but drove out of business many dishonest and irresponsible men and reduced the sale of impure milk very markedly.

To sum up, I may say that the milk law has been of great value to the producers in northern New Jersey.

As a commercial measure the statute has not affected West Jersey to the same extent, for the reason that prices seem to be based more upon the quality of the milk offered for sale than elsewhere in the State and hence was not so much needed. Prices vary from four and a half to seven and a half cents a quart, wholesale, in this portion of the State, the latter price being paid for very rich Alderney or Jersey milk. The dealers in the cities seem to be benefited, however, for they are protected from fraudulent practices.

The result from a sanitary standpoint.—While we cannot estimate the improved condition of the public health, nor derive much information from the study of vital statistics, in relation to the diminished sale of impure milk, yet probably infantile mortality has been reduced since the quality of the milk sold in our large cities has

been regulated by law. We throw this out as a hint, for of course we cannot bring dollars and cents to bear on the problem as we did in the review of the commercial side of the question.

When the work of inspection was begun in 1880, the amount of adulterated and impoverished milk sold in the State was enormous, and no city or town could be visited without finding the supply more or less impure. The quality of that shipped on the railroads was often impure.

During the four years embraced in this review nearly every city and town of any importance has been visited, and I am in a position to say that to-day cases of flagrant violation of the law are extremely rare, and none but the criminal will run the risk of detection which must sooner or latter overtake him. I can also say that never has the milk supply of our State been in such an excellent condition.

THE STATE STANDARD.

Section 4 of the milk law requires that milk which shall contain less than twelve per centum of milk solids shall not be sold, and, for the purposes of the act, milk which may fall below this limit shall be deemed to be adulterated.

Probably no one section of the law has been so much questioned. Why was it sanctioned or required? What right has the State to fix an arbitrary standard? Why was twelve per centum settled upon as the limit? These and other questions have been asked, and we may reply that it was required because, as the law demands a chemical analysis, it is absolutely necessary to set up a limit in order to establish a criterion by which to judge milk, and in case of trial at court to have a standard with which the sample in question might be compared. As to the right of the State to fix a limit, it may be said that the State avails itself of an inherent right and requires, for instance, that a gallon measure shall contain so many cubic inches, or that a barrel of flour shall weigh so much, or that, in branding or packing fish or pork, certain arbitrary methods shall be employed, or in the sale of illuminating oils only a certain grade shall be used for house illumination and fixes an arbitrary flash test to be used; without giving any more instances we may state that the grade, weight or other qualities may be and are fixed by statute. It has been decided by the Supreme Court, in the cases previously quoted, that the State has the right to make a standard for milk, and that standard may not only insist on purity, but may demand a certain degree of excellence.

In other States a limit for milk is set up by law; thus, in Rhode Island, twelve per cent. of solids, and two and one half per cent. of fat is called for in Massachusetts, thirteen per cent. of solids is required. The Society of Public Analysts of Great Britain, also, has fixed upon an arbitrary limit of nine per cent. of solids not fat, which is higher than our standard.

Why was twelve per cent. fixed upon as the limit in this State? It was found, after repeated trials, that pure milk from a healthy cow rarely or never fell below that limit when analyzed by a fair but accurate method of analysis, and I may say that it would be impossible to obtain a sample of the mixed milk of two or more healthy cows that would, upon analysis, yield less total solids than the standard calls for. But, to judge this standard, a method of analysis similar to, and not more rigorous than those used by the analysts of this State must be employed, for it would not be fair to offer other analyses obtained by crude and inaccurate methods Any method which permits the addition to the milk of any adventitious substances,

such as sand, plaster of Paris, sulphate of barium, etc., must not be employed in testing the standard, for these methods have been proved to be inaccurate, and have been abandoned by all chemists who have had much to do with milk analysis. The chemical side of the question will be discussed further on.

A word here as to the claim that the standard is an average. In answer to this, I shall say that the standard is not an *average*, but is a *limit*, and was not arrived at by averaging, but was adopted when it was conclusively shown that the milk produced in this State never went below a *limit* of twelve per cent. of milk solids.

Persons who object to the standard would usually resist the legalizing of any limit, and the objection is not so much against the limit fixed by law, as it is against any limit whatever.

With the view of testing the State standard to see if any injustice can be done by it, I have had samples collected in nearly all the counties in the State, and have submitted them to the public analysts of this State for analysis, and the results can be seen by reference to the following tables. No attempt was made to select herds or cows, but the only restriction placed on the collection of samples was, that the purity of each one should be undoubted, and none were to be submitted as pure milk, unless the collector actually saw them milked from healthy cows.

All the samples in Tables II. and III. were collected by Dr. Rogers, Mr. Vandegrift or myself, hence, their authenticity can be vouched for.

Besides this series of investigations, the State Board of Health advised a full and fair re-examination to see whether there was any possibility of harm to the rights of producers from the standard. Samples were collected, as in the other case, and were analyzed by Prof. A. R. Leeds, of Stevens Institute; by Prof. H. B. Cornwall, of Princeton, and by Shippen Wallace, of Burlington. As I have not seen the reports I cannot express my opinion, but the full returns will be found in this volume.

In closing this branch of the subject I shall say that the offer made each year for the past three years is now renewed, and any person doubting the accuracy of the State standard, and thinking that any cow in his herd produces milk below the limit, has the privilege and the right to call on the inspector, or any analyst, or on the State Board of Health, for a test analysis to be made. The only restriction placed on this offer is that the sample shall be drawn from the cow in the presence of some authorized person, in order that there shall be no intentional or unintentional mistakes.

Table I. is compiled from reports made by the State Agricultural Experiment Station. The cattle were undoubtedly better fed and cared for than the average herds throughout the State, and hence the solids are perhaps high; but to offset the favorable factors the method of analysis employed at the Station is one calculated to give lower results, as to solids, than any method used by our analysts.

The method of analysis followed at the Station is as follows: Total solids are obtained by drying a weighed quantity of milk, with ignited sand, at 212° F. till constant weight has been reached.

Fat is gotten by taking a weighed quantity of milk, evaporating to dryness with ignited sand, drying thoroughly at 212° F. and then extracting the fat with ether in an extraction apparatus.

The ash in the analyses given in the table was determined by difference, which will probably account for the large percentage. (First Annual Report, page 56.)

TABLE I.

ANALYSES MADE AT THE NEW JERSEY EXPERIMENT STATION.

	Total Solids.	Fat.	Solids not Fat	Ash.	Sp. Gr.	
Corn meal ration, herd of 3 cows; average of 4 daily analyses..	13.88	4.16	9.72	......	1.0344	Bulletin No. XXIV.
Sorghum meal ration, herd of 3 cows; average of 4 daily analyses................	14.12	4.29	9.83	......	1.0348	" " "
20 days feeding trial, herd of 3 cows; average of 5 daily analyses......	13.55	4.49	9.06	......	1.0327	" " XIX.
	14.01	4.42	9.59	......	1.0343	" " "
	13.55	[illegible]	9.28	......	1.0340	" " "
	13.87	4.27	9.60	......	1.0340	" " "
	13.87	4.58	9.29	......	[illegible]	" " "
	14.51	4.58	9.98	......	1.0346	" " "
College Farm; mixed milk 6 Jersey cows; average of 13 analyses........................	14.72	5.21	9.51	.91	1.033	1st An. Rep. of Station.
Taylor's Herd; mixed milk 6 Jersey cows; average of 13 analyses..	14.72	5.21	9.51	.91	1.033	" " "
College Farm; mixed milk 6 Native cows; average of 13 analyses............	13.57	4.49	9.08	.92	1.033	" " "
College Farm; mixed milk 5 Ayrshire cows; average of 13 analyses..............	[illegible]	4.83	8.52	.72	[illegible]	" " "
Kelsey's Herd; mixed milk 6 Jersey cows; average of 13 analyses..	14.51	5.19	9.32	.99	1.031	" " "
Dudley's Herd; mixed milk 6 Jersey cows; average of 13 analyses.....	[illegible]	5.20	9.68	.98	1.034	" " "

Table II. gives the results obtained by analyzing the milk of *individual* cows, and hence does not represent the milk of commerce, that being almost always the milk of two or more cows thoroughly mixed. The methods of analysis are noted, and will be described further on.

The specific gravity of each sample was taken on the balance. The ash was determined by ignition of the solids not fat.

Samples 10 and 11 were from imported Alderney cows: the small amount of total solids will be noted, and will surprise those who think that this quality of milk is always extremely rich.

Sample 12 was from an Alderney cow, two and one half years old, belonging to Mr. S. W. Taylor, of Burlington. Sample 13 was from registered Alderney cow No. 5,548, belonging to Mr. Taylor's herd. The analysis is equal to that of cream.

TABLE II.

ANALYSES BY PUBLIC ANALYSTS OF NEW JERSEY—INDIVIDUAL COWS.

No.	Origin of Sample.	Time of Milking	Breed.	Age.	No. of Calves.	Total Solids.	Fat.	Solids not Fat.	Ash.	Sp. Gr.	Methods of Analysis.	Analyst.
1	Passaic Co.......	Night	Holst'n	3	1	14.31	4.76	9.55	.66	1.033	Ritthausen	A. R. Leeds.
2	"	"	Native..	8	3	12.61	3.30	9.31	.74	1.035	"	"
3	"	"	3/4 Nat.	11	10	13.48	4.46	9.02	.75	1.0315	Cairns.......	H. B. Cornwall.
4	"	Morn	" ...	11	10	13.62	4.36	9.26	.75	1.0325	"	"
5	"	Ngt	{ 1/2 Jers. 1/2 Nat. }	6	5	12.51	3.50	9.01	.77	1.0324	"	"
6	"	Morn	" ...	6	5	13.19	3.62	9.47	.77	1.0339	"	"
7	"	Ngt	{ 3/4 Jers. 1/4 Ald... }	6	5	13.84	4.57	9.27	.70	1.0323	"	"
8	"	Morn	" ...	6	5	15.07	5.36	9.61	.78	1.0336	"	"
9	Sussex Co.........	Night	Ald'rny	4	...	15.18	6.06	9.12	.68	1.032	Ritthausen	A. R. Leeds.
10	"	"	"	4	...	12.34	3.56	8.78	.48	1.031	"	"
11	"	"	"	5 1/2	...	12.89	4.52	8.37	.59	1.030	"	"
12	Burlington Co..	....	"	2 1/2	..	16.74	7.10	9.64	.62	1.0295	Wanklyn ...	S. Wallace.
13	" ..	....	"	......	...	21.73	12.25	9.48	.66	1.0243	" ...	"

Table III gives the analyses of *herd milk*, that is commercial milk, the mixed milk of two or more cows. This table represents the milk seen by the inspector and sold to consumers, hence it is more liable to be compared with the standard set up by law and it is for this reason that so great a number of samples were collected and analyzed.

All these samples, with the exception of a few to be noted further on, were from herds made up of what is known as common cows, that is, none of the cows were of any particular breed. The herds vary from two to eighteen cows, and the ages from two to twelve years. The feed was pasture, bran, meal, ensilage, and in fact nearly everything that is fed to cattle. Some samples were from the sand dunes of the ocean counties, where it is said that the cattle get little but scrub oak and sea air.

With but nine exceptions the analyses represent herds, and, with these exceptions, the milk of the same herd does not appear twice in this table. I mention this for fear that some may think that a few herds were tabulated many times.

The sixty-five analyses represent fifty-eight herds.

As with the results in Table II, the method of analysis is noted. The specific gravity in each case was taken on the balance. The ash was determined by ignition of the solids not fat.

Samples 1, 2, 3, 6, 7, 8, 9, 10 and 11, were obtained in Sussex county and were taken from lots of forty quarts each, thoroughly mixed. Sample 4 was the mixed milk of seven native cows in Passaic county. Sample 5 was from Mercer county, from a twenty-quart can.

Sample 12 to 65, both inclusive, were collected in Burlington, Camden, Gloucester, Cape May and Cumberland counties.

Numbers 32 and 33 were what is called "off shore" milk and the cows were very poorly fed. The samples were collected with the expectation that the analysis would give results lower than the standard.

Samples 57, 58, 59, 60, 61, 62 and 63 were from a herd made up of the following description of cows: one cow, one-half Holstein; one, Guernsey; two, half Jersey, half Holstein; one, short horn; two, three-quarters Guernsey; seven cows; yield forty quarts.

Sample 64 was from the mixed milk of the noted herd of high grade Jersey cattle owned by Mr. C. H. Taylor, of Burlington.

Sample 65 was from the mixed milk of a similar herd, owned by Mr. W. S. Taylor, of the same place. The two latter samples are added to our list to give examples of exceedingly rich milk.

TABLE III.

ANALYSES BY THE PUBLIC ANALYSTS OF NEW JERSEY—HERD MILK.

No.	Total Solids	Fat.	Solids not Fat.	Ash.	Sp. Gr.	Method of Analysis.	Analyst.
1	12.29	3.80	8.49	.63	1.031	Ritthausen.	A. R. Leeds.
2	12.71	4.06	8.65	.73	1.031	"	" "
3	12.97	4.08	8.89	.68	1.030	"	" "
4	13.88	4.49	9.39	.66	1.032	"	" "
5	13.68	3.76	9.92	.71	1.031	Cairns.	H. B Cornwall.
6	12.67	3.33	9.34	.....	1.029	"	" "
7	13.98	4.13	9.85	.....	1.032	"	" "
8	14.89	4.78	10.01	.....	1.032	"	" "
9	14.21	3.87	10.34	.....	1.032	"	" "
10	14.81	5.22	9.59	.....	1.030	"	" "
11	13.97	3.85	10.11	....	1.032	"	" "
12	13.26	3.60	9.66	.64	1.0324	Wanklyn.	Shippen Wallace.
13	13.98	4.34	9.64	.63	1.0319	"	" "
14	13.50	3.94	9.56	.68	1.0319	"	" "
15	12.36	2.92	9.44	.66	1.0319	"	" "
16	13.75	3.85	9.90	.54	1.0324	"	" "
17	13.00	3.52	9.48	.68	1.0319	"	" "
18	12.92	3.44	9.48	.68	1.0319	"	" "
19	14.44	4.15	10.29	.62	1.0336	"	" "
20	14.34	4.22	10.12	.62	1.0330	"	" "
21	14.38	4.34	10.04	.62	1.0330	"	" "
22	13.42	3.52	9.90	.64	1.0324	"	" "
23	13.14	3.71	9.43	.62	1.0313	"	" "
24	14.29	4.93	9.36	.68	1.0330	"	" "
25	12.51	3.20	9.31	.66	1.0313	"	" "
26	13.55	4.55	9.00	.60	1.0301	"	" "
27	13.85	4.15	9.70	.66	1.0324	"	" "
28	13.05	3.67	9.38	.60	1.0306	"	" "
29	13.67	3.83	9.84	.70	1.0330	"	" "
30	13.63	3.59	10.04	.70	1.0340	"	" "
31	14.51	4.53	9.98	.71	1.0319	"	" "
32	12.16	2.72	9.44	.62	1.0319	"	" "
33	12.73	3.85	8.88	.58	1.0295	"	" "
34	13.87	4.04	9.83	.66	1.0324	"	" "
35	14.61	4.55	10.06	.68	1.0324	"	" "
36	13.38	3.69	9.69	.66	1.0313	"	" "
37	12.53	3.47	9.06	.62	1.0301	"	" "
38	12.60	3.60	9.00	.60	1.0301	"	" "
39	12.70	3.12	9.58	.65	1.0319	"	" "
40	12.55	3.12	9.43	.66	1.0319	"	" "
41	13.50	3.93	9.57	.68	1.0313	"	" "
42	13.13	3.50	9.63	.60	1.0313	"	" "
43	12.71	2.41	10.30	.72	1.0348	"	" "
44	12.92	3.30	9.62	.70	1.0319	"	" "
45	12.56	2.75	9.81	.70	1.0330	"	" "
46	13.36	4.13	9.23	.66	1.0304	"	" "
47	13.38	3.94	9.44	.67	1.0319	"	" "
48	13.91	4.37	9.54	.65	1.0307	"	" "
49	13.00	3.85	9.15	.60	1.0313	"	" "
50	13.48	4.05	9.43	.68	1.0307	"	" "
51	13.76	4.35	9.41	.68	1.0307	"	" "
52	13.88	4.65	9.23	.66	1.0290	"	" "

TABLE III.—*Continued.*

No.	Total Solids	Fat.	Solids not Fat.	Ash.	Sp. Gr.	Method of Analysis.	Analyst.
53	12.76	3.01	9.75	.70	1.0324	Wanklyn.	Shippen Wallace.
54	13.14	3.46	9.68	.70	1.0324	"	" "
55	12.68	3.21	9.47	.64	1.0319	"	" "
56	12.94	3.76	9.18	.60	1.0301	"	" "
57	15.45	6.44	9.01	.68	1.0290	"	" "
58	15.02	5.76	9.26	.64	1.0290	"	" "
59	14.66	5.30	9.36	.66	1.0285	"	" "
60	14.30	4.94	9.36	.66	1.0301	"	" "
61	16.62	6.02	10.60	.68	1.0342	"	" "
62	15.19	4.97	10.22	.68	1.0330	"	" "
63	15.72	5.91	9.81	.67	1.0304	"	" "
64	22.08	12.83	9.24	.56	1.0240	"	" "
65	19.18	9.40	9.78	.60	1.0284	"	" "

METHODS OF MILK ANALYSIS USED BY THE PUBLIC ANALYSTS OF NEW JERSEY.

WANKLYN. *Milk solids.*—The milk is thoroughly mixed, and five grammes weighed out in a platinum dish. The dish is then placed on a water-bath, the water in the bath is made to boil vigorously and maintained boiling for *three hours*. At the expiration of this period, the milk in the dish will have completely dried up. The dish is now removed from the bath, its outside wiped dry, and itself and contents forthwith weighed.

The weight of the dish subtracted from the weight of conjoined dish and contents leaves the weight of the milk solids in the five grammes of milk taken. By multiplying that weight by twenty, the per cent. is arrived at.

Fat.—The residue, milk solids, may be taken for the determination of the fat. Ether is poured into the dish, and heated to the boiling point, and poured out through a small filter. This operation must be repeated at least three times, each time the ethereal solution being poured out through the filter.

The ethereal solution of fat having been obtained, the next point to be attended to is the evaporation of the ether, and the getting of the residue of fat. This is done by evaporating off the ether and weighing as in the case of milk solids, the result being the fat. (Milk Analysis. A Practical Treatise, Etc., by J. Alfred Wanklyn. New York: 1874. Page 19.)

This method was brought out in England by Prof. Wanklyn, in 1870, and by it, during the past thirteen years, he has analyzed many thousands of samples. The method is adopted by the public analysts of Great Britain—who number nearly one hundred—and is the official method used under the Food Adulteration Act of that country.

We shall discuss this method in comparison with the others later on.

The standard of this State was established upon this process, as was also that of Rhode Island.

The following averages were obtained by Wanklyn's method:

Wanklyn, England, town milk	14.06	Total Solids
" " country milk	12.45	"
J. Carter Bell, England, 181 cows	13.80	"
E. E. Calder, Rhode Island, 440 cows	12.77	"

CAIRNS. *Milk solids.*—The milk is thoroughly mixed, and five grammes weighed into a small platinum dish. Evaporate over a water-bath until the milk solids look dry; then dry in an air-bath at 100° to 105° C., for one hour to one and a half hours; weigh, and dry again, for one-half to three quarters of an hour, and weigh again. Repeat this treatment until the loss is less than five milligrammes. Weight of residue, minus dish, equals milk solids.

Fat.—Pour about 10cc. of ether on the milk solids, allow it to soak into the solids for a few minutes, place the dish on the water-bath and keep it there till the ether boils. Then, after drying the bottom of the dish, pour the ether into a weighed beaker. Repeat this treatment with ether about six times. Cover the beaker with a piece of filter paper, and evaporate off the ether over hot water. When the ether is all gone, dry the beaker in an air-bath at 100° to 105c., for about fifteen minutes. Weigh; the weight minus the weight of the beaker equals the fat.

The residue in the dish may also be weighed; the loss equals the fat. The two weighings of the fat, direct and indirect, should agree within about five milligrammes. (A Manual of Quantitative Chemical Analysis, by Frederick A. Cairns. Revised edition. New York. 1881. Page 204.) This method is taught at the School of Mines, Columbia College, New York, and is used by the New York analysts.

RITTHAUSEN. *Milk solids.*—Weigh out five grammes of the milk in a platinum dish, add 5cc. of alcohol and evaporate to dryness on a water-bath. Dry at 100 degrees C. to constant weight.

Fat.—For the determination of the fat, that substance is precipitated with the albuminoids by a solution of cupric sulphate. For this process two solutions are required. (1.) A solution of Cu SO4, 5 H_2O, sixty-five grammes to the liter of water. (2.) A solution of KHO having a specific gravity of 1.048.

Weigh out 10 grammes of the milk in a weighed 150cc. beaker and add about 90cc. of water. Stir and add 3cc. of the copper solution, then add 1.2cc. of the solution of potash, being very careful that the re-action of the liquid should not become alkaline.

Allow the precipitate, which contains the albuminoids and all the fat, to settle, decant through a filter dried at 110° and weighed; when as much as possible has been decanted add about 100cc. of water, stir, allow to settle and again decant through the same filter. Finally, transfer the precipitate to the filter and wash until the total of the whole filtrate and washings amounts to just 250cc.

The filter with the precipitate is removed from the funnel and spread on a flat piece of glass and allowed to dry until the greenish mass can be easily cut with a knife-blade without sticking to it. The drying can be facilitated by subdividing the precipitate with a small spatula; still, it must not be carried so far that the mass becomes horn-like, otherwise the fat cannot be easily extracted. When drying has gone far enough, the filter and its contents are transferred to a Gerber's extraction apparatus and the fat extracted into a weighed flask. The ether is distilled from the flask and the fat dried at 100° C., cooled and weighed.

If the per cent of the albuminoids is desired, proceed as follows. The filter and precipitate, from which the fat has been removed, are dried at 100° C., cooled and weighed; they are then burned completely in a platinum dish, and the ash plus the

CuO are weighed. The difference between the filter and the filter plus the precipitate minus the ash and CuO, gives the total amount of the albuminoids.

The precipitate of the albuminoids is so complete by the copper solution that even Millon's re-agent gives no precipitate in the supernatant fluid. The precipitate of the fat is purely mechanical, but it is perfect, every portion going down with the albuminoids.

A brief account of this method and a description of the extraction apparatus may be found in "Chemical and Physical Analysis of Milk," by N. Gerber, New York, 1882.

Dr. Edgar Everhart, Assistant in the Chemical Laboratory of Stevens Institute, kindly furnished me with notes on the process, which was introduced and is used by Prof. A. R. Leeds, who speaks very highly of its accuracy and the ease with which it is manipulated.

It was my intention to compare these methods, but, as I understand that Prof. Leeds and Prof. Cornwall will treat of this branch of the subject in their reports, I will add only a few brief notes.

It will be well to repeat, at this point, what was said before, that, if we are to judge the standard, or to compare samples of milk with it, a method of analysis equal to and not more rigorous than that by which it was adopted, should be employed. To use a process that will destroy some one of the ingredients, or that will falsify the results, would be unjust. What is required of the method is, that when a sample is submitted to two or more chemists for analysis, the results obtained by each shall be accurate and concordant. If this result can be obtained by each chemist, working by a different method, the problem is easy of solution; but if it is necessary that all shall use the same process, it seems to me very important that some one method should be fixed upon and used, to the exclusion of all others.

Without going into detail I will state that I am fully persuaded that Wanklyn's method of milk analysis is all that can be desired. It is accurate, and two or more analysts working at the same specimen can arrive at concordant results. Any method that requires prolonged evaporation or drying is very apt to get false figures, for the reason that such processes destroy or dehydrate the milk sugar, and thus make the total solids appear lower than they really are. The use of sand or any substance added to increase the bulk of the milk has been abandoned by nearly all chemists for the reason that not only is it impossible to get concordant results, but, as sand is a hygroscopic substance, accurate weighing is impossible or difficult.

As to the fat extraction, it may be said that where an extraction apparatus is used, such as Liebig's, Soxhlet's or Gerber's, where an almost constant circulation of ether is maintained through the milk solids, higher fat determinations will result than by the Wanklyn or Cairns methods. And if the ether be not dry, or if the solids contain much moisture, there is a source of error in the possibility of extracting some of the milk sugar, which result will cause the fat to appear greater than it is. But, with these few hints, I leave this branch of our topic for others to discuss.

In closing I would repeat what I have stated in former reports, that to do the work of inspection in a thorough manner and to accomplish better results, more attention must be given to the subject by local Boards of Health. It is clearly the duty of these Boards to interest themselves in this matter, and while a general oversight should be maintained by the State, the bulk of the work and the burden of expense should rest on local government.

I take this opportunity to thank my assistants and the analysts, for the excellent services rendered the State and the health interests of the people by them, at a very low rate of remuneration, hoping that their efforts will be appreciated.

CIRCULARS AND LAWS.

CIRCULAR No. XXXVII.

SCHOOL AND HEALTH CIRCULAR No. 3, FOR PARENTS, GUARDIANS, CHILDREN, TEACHERS AND TRUSTEES.

HEALTH, CHARACTER, AND INDUSTRY.

These are the three best things to have all through life.

POWER, SUCCESS, AND HAPPINESS

Are their companions. Without health, character may be good, but it has a burden to carry; without health, industry is tied down, or pulls too heavy a load; without health, power, success, and happiness have three of their best friends in trouble. Let us then learn all we can about health; how to have it; how to keep it; what use to make of it, as we go along with thirteen years of school life, between five and eighteen.

That is a poor school which takes away one's health, and to keep health is easier than to find it after it is lost.

TO PARENTS OR GUARDIANS.

See to it that the child goes to school in a proper condition. This means, first of all, cleanliness all over. A child not washed all over at least each week, with warm or cool water, is not fit for school. Some will need a bath oftener. Children need to wash the face and hands, and to comb and brush out the hair at night, as well as morning. Let the mouth be rinsed with water, morning and evening, or the teeth brushed, so as to have a pure breath.

Have clean, thin flannel for clothing, next to the skin, with such additional outside garments as may be necessary for warmth, and shoes and stockings that will protect the feet from dampness. A dry pair of socks and a clean handkerchief are not amiss in the satchel. Let no child start for school with damp clothing; when active, we can bear dampness a while, but to sit in wet clothing is always a risk. Tell the child, if damp or chilly, to let the teacher know it.

A good, plain, unhurried breakfast is always important to the school child. The young are better off without coffee or tea; but some may need a warm drink for breakfast in cold weather, such as sweetened water, sugar and milk, and water or

milk flavored with cocoa. If the child will not be at home and at dinner within five hours after the close of breakfast, have him carry a small and easily digested lunch, to eat at recess, or at an appointed time in school. It should be light bread and butter, with fruit or jelly, and not over-large, if there is to be a meal at home by two o'clock. Have the child chew before swallowing, as it cannot chew after swallowing, as cows do. Let every boy know that tobacco in any form is so injurious to growth and vigor as to make its use by him a breach of school laws and of good sense.

See that the child gets plenty of good sleep, in a well-aired room, and does not go to bed just from the book, so as to be tired and anxious about a lesson.

When the child is really unwell, do not send him to school just for the name of being punctual. The parent should judge and decide wisely, mindful that headache, pain, or weariness in a child always requires rest. If your child is sick, or if there is sickness in the family, have the judgment of your doctor as to the time of staying at home.

TO THE CHILD.

You must learn how to take care of your own health. Others may tell you; but experience and advice should early lead you to feel how important it is not to abuse the body. Read this leaflet and mind it. Help your parents and teachers to keep you clean and neat. Be clean in person, in thought, in word, in action. A child that has clean feet, clean hands, clean nails, clean ears, and combed hair, is generally clean and neat.

To get peevish or worried over a lesson is not wholesome. Get, if need be, a part of your lessons at home. The load is often too heavy because we try to carry too much of it at once, or in too short a time.

In sitting, do not lean over too much, or too constantly. While standing, stand erect. Neither fold the arms in front nor put them behind, but let them hang naturally and easily at the sides. In studying, try to have enough light without a glare; if light or print troubles you, tell the teacher. If you are really unwell, let him know it; a headache that may not require you to go home may be a reason for change of position, or rest from study; only be upright, and do not pretend. In all things seek to take good care of your health, since your happiness and usefulness so much depend upon it.

TO THE TEACHER.

Know that health and habits in reference thereto are important parts of the education you are seeking to conduct. In large schools, a steward or janitor should receive each pupil, and know that the child enters on the work of the day healthily; where no such person is provided, the teacher must include this with many other things in his care-taking.

Children must not hang damp and sometimes soiled overclothing in a close, unaired room, against other damp or wet garments. Each child's clothing should be kept by itself.

The regulation of heating and ventilation is very important; the thermometer should guide you as to heat. The sensations of those who are well, and who are properly clad, help much to guide as to moisture, warmth, purity of air, draught, etc. Air can often be let in through a sieve of wire, or between the two sashes, with a board strip beneath the lower one, when a direct draught would be hazardous.

Walls often need whitewashing, kalsomining or painting, and all wood-work should be frequently and thoroughly washed. Sweeping carefully under the desks and dusting

are important. The condition of the rooms, the distribution of desks, according to size of persons, light, variation in study and position, exercise, airing of rooms while empty, moderation of competition, assortment of work to the capacity of the child, and quickness to perceive the occasions for temporary variations and adjustments are essential in the skilled oversight of the teacher; he must feel that he has this charge to keep. It is a joy to get school-work out of a well child, and to help rather than to complicate inability and invalidism. Remember that the kind of day has something to do with the capacity for work. While light gymnastics should be practiced daily in all schools at stated periods, on rainy or cloudy days special exercises should be given, during which the room can be more thoroughly ventilated. Give zest and advice as to out-of-door as well as to indoor exercises

Not only talk to the pupils about health, and enforce its rules, but train them in the practice of it, so that "errors in physical conduct or ideas will be as readily pointed out for amendment, as mistakes in grammar, pronunciation or behavior." Thus make them valid, instead of invalid; promote their well-fare, instead of their ill-fare, and enable them to do their work in life with ease instead of disease. Feebleness of constitution or special ailments, are too often the result of errors in the school discipline. More suffer and die from the frailities of ill health, thus acquired in childhood, than from diseases which are said to be caught.

WHAT SHALL A TEACHER DO ABOUT CONTAGIOUS DISEASES?

Acquaint parents, by this circular, or in some other way, with the fact that it is their duty not to convey, through their children, contagious diseases to others. If a child seems unwell, or you find out there is sickness in the house he lives in, inquire as to it. Ask the attending physician or Board of Health to apprise you of any house from which a pupil should not be received. Hold a physician or Board of Health responsible for the time of return to school. In cities, or during epidemics, a permit should be had. Prudence and judgment, but not systems to excite alarm, are required. Small-pox, scarlet fever and diphtheria, need special precautions.

TO TRUSTEES OR BOARDS OF EDUCATION.

You are in trust of all that relates to the school, having accepted an appointment as a guardian of the children, as well as of the teachers and the property. To you, the teachers and the scholars must look for adaptation of structure and furniture, and as the bond between themselves and the community. You must realize that the care of health is a part of education, and that this means, on your part, actual personal supervision, appeal and service; it means facilities for right administration as well as buildings. All the larger schools should have direct instruction in physical education.

The trustee must feel it to be his duty and his business to help in giving the child a fair chance for health and usefulness. The State seeks this for itself as well as for the child. No one can do more for it than the school trustee who will wisely look after the welfare of the child in the school, and mold the sentiment of the people in favor of proper arrangements.

Prevalent cleanliness inside of the building, on the grounds, and in all outhouses, must be secured; defects must be recognized, both as to their reality and the extent of the evils they cause. Neat and good housekeeping of the school home is indispensable. Often it is wise to have the judgment of ladies as to the care of the school rooms. Teachers need to be fully upheld in enforcing rules as to the personal habits of the pupils.

As New Jersey has free schools, in order to secure men and women with sound bodies, fitted for labor, with good character, and mental acquirements sufficient for some useful vocation in life, the overseers of these schools need so to plan as to insure these results. Thus, alone, can we have good citizens, and happy families, and prosperous industries.

Thus health, character and industry keep together as school friends and life friends, and power, success and happiness join their company. So the public school confers blessings on the people and on the State, securing power not less from sound bodies than from sound minds.

For various other items of advice, see Circular XXVIII. of this Board.

CIRCULAR XXXIX.

TO LOCAL BOARDS OF HEALTH.

All township Health Boards should hold a session at the spring meeting of the township committee, to consider any causes of preventable disease and how they are to be abated. The powers of such a Board are clearly defined in various acts, as enumerated in the Sixth Report (1883) of the State Board of Health (page 255, etc.) See especially chapter 155, laws of 1880; chapter 135, laws of 1881; chapter 155, laws of 1882, and chapter 105, 1883, a supplement to an act entitled "An act relating to Local Boards of Health." Under the law every city and every township *must* have its Board of Health.

The Board in townships consists of the township committee, the assessor and the township physician.

I. The Board should have accurate organization, so as to meet at a stated time, having its chairman and secretary, and keeping a record of its proceedings. Its rules of order are the same as other Boards met for the transaction of public business.

II. It is not merely a Board to hear complaints, but to get an accurate idea of evils which cause, or are known to prepare the way for, sickness and death. In one place it may be undrained land, so saturated with water and vegetable matter as by changes in temperature and moisture to give rise to fevers; in another locality it may be poor water-supply or defective sewers, or the want of a sewer system; in another, the careless disposal of garbage; in another, too near proximity of wells and outhouses; in another, cesspools which soak the ground with filth. But in any case, such a Board should be one of inquiry, to collect accurate facts and deal with real evidence. In most Boards will be found some one who knows how to collect and study facts, or keep them on hand for study until enough are gathered.

III. Such a Board needs to keep in view from year to year where sickness and death have occurred, and the causes thereof, to know the number of children born and living in their district, so as to know the age of the material subject to disease, and various other facts which, when observed with care, over a sufficient period, lead to conclusions as definite as those derived from a study of any other of the courses of nature.

Such a Board has great value as an educator of the public in the avoidance of the causes of ill health. It is in a position to advise and to acquaint the public with the various laws as to the prevention and abatement of evils prejudicial to health. Many bad household and town arrangements are those of ignorance, and are easily corrected when a better way is shown. The Board can also, by its circulars, ordinances and instructions, deter many from infringements which would otherwise occur, and thus act as a preventive of disease. Most Boards should have an executive officer, who should be informed as to the most dangerous nuisances and the best means of riddance. Cities need to have a special sanitary inspector, upon whose good judgment and knowledge they can rely for the correction of many evils as well as for the enforcement of the law when necessary.

IV. It is not necessary, under the general laws of the State, always to prove disobedience of an ordinance, but only that the thing complained of is contrary to the law. Ordinances are valuable as warnings or as defining more closely the scope of the law. It has been a mistake of many cities to promulgate too many ordinances and to enforce too few. A waste of dead letter makes administration less perfect. Neither do health laws or health codes supersede common law. They provide speedy modes of riddance, leaving any question of trespass to be decided afterwards.

It is important that special powers should be exercised in all that class of cases in which the usual process of courts would be too tardy, and that by inquiries and investigations and recommendations, Boards of Health should aid forward all efforts made under common law or under statutory provisions for appreciating the public health, so far as its protection falls under such jurisdiction.

The duty of discussing and exposing evils, of suggesting relief, of making recommendations, and of giving information is a great one. Boards of cities and townships do very much to prevent and abate evils, by the very facts which are brought out in their discussions, and by turning public attention to existing evils.

In our recent experience with small pox, new evidence has been furnished how necessary it is to have such Boards in all localities, so that when any case of contagious disease, or any nuisance hazardous to health occurs, there may be no delay. The citizens of each precinct have the right to be able at once to find some authority charged with the duties specified in the law. Forethought is better than afterthought.

While the law requires expenses of over fifty dollars per year to be ordered or approved by the township committee, the township or town committee, or council of a city may authorize further expenditures, and in case of special meetings or service on the part of the Board, may compensate therefor, if the town committee, etc., so direct. In some special investigations the State aids to a limited extent

When there is no township physician, the State Board of Health has the right to appoint a medical member of the Board.

There must be a report made in October of each year to the State Board, as required by law.

Health Boards have an important duty in co-operating with the city clerks or assessors in securing complete returns of marriages, births and deaths, certified copies of which can be had, by those entitled thereto, on application by letter to the Secretary of State.

With these properly returned, we are able to state from year to year, or through longer periods, the health of any locality. Thus any hearsay as to healthfulness or sickness can be corrected, and if any disease is found to prevail above a general average we detect causes and correct them The progress of population and the causes

affecting the growth of sections can be studied, not merely for curiosity, but in the interests of political economy and social advancement. It is thus that whole communities have their health interests under supervision. As health is capital and wages, we thus look after a great condition of success. There is no more important census of population. It can only be secured at the time the events it records are occurring. If left to the end of the year, or for semi-decennial record, experience shows that the results are too imperfect for study. The law is now well complied with by ministers, physicians, etc., except when carelessness or postponement as to birth returns annoys town clerks and assessors and delays tabulation.

It is important that records of meetings and a copy of reports be kept in the township health book. This aids in future study. The State index and transcription of marriages, births and deaths, which is kept in full, furnishes data for comparison and enables localities to know their condition and what evils they need to guard. Cities now only need to transcribe the age, sex, date, number of street and cause of *death*, and to see that the blanks sent for record are properly filled. City clerks and Boards of Health should be able to tell each death that has occurred in any house through a series of years, as thus we find out local causes of disease.

The several reports of this Board clearly indicate the work to be done. Some of these cannot now be furnished, but the last report will aid much in this direction. Local Boards must see to it that all circulars, reports, etc., sent, are not carelessly retained by assessors or others, but passed over to each successive Board. We send such reports, as also all circulars and blanks, to any citizen on receipt of postal.

In addition to the duties indicated, Local Boards should notify us of any contagious diseases among animals, with the names and post office address of owners. The laws against adulteration of foods and drugs, against poor kerosene, and many others, come under the care of these Boards.

There is now enough law for most cases. What is most desirable is a comprehension of what is needed and proper to be done, and the doing of it by right methods. Those who have power to enforce a law, because of that power have far greater chances for persuasion in securing right action without legal process. But this must not mean delay or tampering with dangers to the health. We ask all Boards to become informed as to their duties, and then to perform them with that prudence, energy and determination which the circumstances of each case may require.

Any letters of inquiry may be addressed to the Secretary of the State Board or Bureau of Vital Statistics, Trenton.

We add a number of suggestive questions indicating what Boards of Health should know or inquire about. Some of these apply only to cities and some only to townships, but all are worthy of thought, according to the needs of each locality.

What is the area of the city or township?

What is the density of population?

What is the character of geological structure and soil?

What the natural drainage?

What the needs of additional drainage arising from structural alterations?

Are there ponds, or stagnant pools, or any other interferences with proper drainage?

Is there a sanitary map, so that the location of all underground pipes or the plan of all underground work and the contour of surface can be easily known?

Are plans devised or executed for proper drainage?

In cities, is foresight had as to public parks?

Are there any free baths?

Are there careful arrangements to *prevent* nuisances, as well as for their abatement?

Are cases of contagious disease reported to you either by the head of the family or by the physician?

Have you plans and provision for dealing with any case of contagion, such as small-pox, typhus fever, etc.?

Is there any sanitary inspection of school houses or other public buildings?

What trades or occupations are injuring the health of operatives?

Have factories any system of ventilation?

Are there factories of which the odor or refuse is a nuisance?

Are there slaughter houses which are a nuisance?

Is there any inspection of city stables, or cow pens or hog pens?

Is there any inquiry into the adulteration of milk, of food, or of drugs?

Is kerosene ever tested, or are there accidents therefrom?

Is a record kept of diseases, or of deaths, and their causes and locality, that you may compare different parts of the same city or township?

Do you aid the assessor or city clerk in securing the returns of marriages, births and deaths, so that the vital and essential conditions of local prosperity may be known?

Is vaccination systematically secured?

Does the assessor or city inspector regularly report to you any condition which he regards as hazardous to the public health?

HOUSES.

What is the condition of cellars and basements?

How are the walls as to dryness and dampness?

What fire-escapes or provisions for fire?

What the condition of tenement houses?

What is the water-supply of each house?

Is there a well or cistern supply? How many use wells instead of the public supply?

Are there any cesspools which have been once used and then filled up?

How near are cesspool, well and out-house?

Is there outside ventilation between the house-pipe system and the cesspool or sewer?

Is there a trap between it and the cesspool or sewer? Any grease trap?

Does the Board of Health know the sanitary condition of each house in those matters which most concern the health of the community?

If there are sewers, is their condition thoroughly known? Are they ventilated?

Are house connections watched and carefully superintended when new buildings are erected or when changes are made?

How is storm-water disposed of?

Give size, location and construction of present cesspool, and how emptied.

How are ashes, garbage, etc., disposed of?

Are there house or outdoor water-closets? If so, how are they constructed, cared for or emptied?

For other questions and suggestions, see the Reports of the State Board of Health.

E. M. HUNT, M.D., *Secretary.*

CIRCULAR XL.

AS TO THE HEALTH OF OPERATIVES.

In the work of examination into various industries, with a view to determining their effect on the health and vigor of those employed in them, and upon their families, there are many points of inquiry which must be left to the judgment of the examiner.

The design of this circular is to suggest the outline of the work proposed, which may be added to as the need of each special industry may seem to demand. Where the inquiry is as to classes instead of any specified department, the usual division is—

I. Cultivators of the soil.
II. Active mechanics abroad.
III. Active mechanics in shops.
IV. Inactive mechanics in shops.
V. Laborers—no special trades.

For inquiry into special occupations, the following points are to be thought of:

I. Occupations deleterious by reason of the inhalation of (*a*) Irritating, (*b*) Poisonous, (*c*) Offensive; (*A*) VAPORS AND GASES, or (*B*) DUST, or (*C*) by ABSORPTION through the skin.

II. Occupations that involve exposure to—
(*a*) Elevated or variable temperatures.
(*b*) Over-use of certain organs.
(*c*) Constrained positions.
(*d*) Sedentary life.
(*e*) Exposure to accidents.

The following outline will serve as a guide to observation and inquiry:

I. The sanitary condition of the place of labor; its locality, construction, drainage, facilities for light and air, water, heating, fire-escape, and for the removal of all wastage or material injurious to health; its housekeeping in the interest of cleanliness and comfort; modes of preventing or of reducing to a minimum all effluvium nuisances; of preventing dust, or so removing it by fans or sprinkling as to diminish its inhalation, modes of protecting from accident by machinery, or from irritating material used in the occupation; modes of supplying a sufficient amount of fresh air without draught, both in summer and winter; also arrangements for washing, dusting, etc., and sanitary inspection.

II. The sanitary conditions of the persons employed in each department; their general habits as to sleep, cleanliness, tobacco and alcoholic drinks; the kind of food and arrangement of meals; how far some head covering or some overall is used to protect self and clothing from dust; the evidences of good or ill health, as afforded by appearances and by the personal testimony of the person or of friends; the effect of the work on heredity, as also whether those whose parents or grandparents have pursued the same occupation inherited a reduced physical stamina; the amount of time lost by sickness; what complaints are most incident to the work; tables of mortality

showing the actual deaths of those employed, or of those who had left the employment on account of ill health. Give age, sex and cause of death, etc., as in usual certificate.

III. The mode of pursuing the occupation; specifications of its various departments and the evils special to each, and the best methods of protection therefrom, and those actually used; the period or duration of labor; is it night work alone, or conjoined with day work? are both males and females employed? if so, are all arrangements fitted for proper separation? is there piece work? what portion of the work is proper for children, and for those of what age, sex or strength, and how long should they be employed in it? constrained or injurious positions in work; what arrangements for change of position or to economize strength and avoid waste fatigue; the income of various workers, so as to know how far it is a sufficiency without other extra labor or family help; what proportion of the adult workers, either male or female, are married; what the condition of the houses in which workmen live.

Those who inspect or who prepare statements need to be familiar with the employment in its details, and to prepare an outline as introductory to the study of individuals and of the effect of trades, or parts thereof, as shown by the accurate history of persons. The report on Hatting in our second report (page 68) will serve as a specimen. Inquiries may be addressed to

E. M. HUNT, M.D., *Secretary*.

CIRCULAR XLI.

(INDUSTRIAL CIRCULAR NO. 2.)

HEALTH COUNSELS FOR WORKING PEOPLE.

HEALTH, CHARACTER, INDUSTRY AND SKILL

Are the capital on which most must rely for support and happiness. Of these not the least is health. Whether or not we are able to do the work we attempt, largely depends upon whether we provide all needful force-producing, repairing and protective materials and methods for operating this personal machinery we call the body. All those who depend upon labor for support have to inform themselves as to the conditions of health, and the evils which they are especially to avoid.

THE BODY, TO BE HEALTHY, MUST BE KEPT CLEAN.

This means, the washing of the body all over, each week, or oftener, with cool or warm water. No cleansing of face or neck or hair or hands will take the place of this. Many who *mean to be clean, but are not* neglect this. In many industries there is a soiling of the body not perceptible, which stops up the pores, and, besides, the natural secretions of the skin need this mode of removal. Neglect of the hair, the ears and the feet often leaves noxious materials about them. The thorough cleansing of the mouth, the nose and the throat, by washing and rinsing, at least three times a day, is especially important to working people who are so much exposed to dust.

The teeth need good care and brushing, because their preservation is so important for good chewing and digestion.

The body, to be kept healthy, must have proper rest. This means, sleep, in a bed and in a room which have been well aired, which are not damp or so cold as to disturb sleep, and for seven or eight hours. It also means relief from fatigue by change of posture. A noon rest, in horizontal position, is often refreshing. Many kinds of work permit a change of position which rests muscles or parts of the body even while the work continues. Workmen do not always *rest* all they can. How to accomplish the most with the least toil is a study for each one. All work is not exercise in its full sense. If not, the change to moderate open air recreation is important. Exercise those muscles which are the least used in your work. Think what your own particular employment demands, and seek to adjust yourself thereto.

THE BODY MUST BE RIGHTLY FED.

Food and force have relations much better understood than formerly. Foods may be spoken of under two great divisions—such as make body or muscle and such as make heat. Most foods contain materials for each. Heat is mostly derived from fats, from foods having starch in them, as bread, potatoes, rice, etc., and from sugars, which are contained in fruits, vegetables, etc. In digestion, the starches are converted into sugar, and thus about equally aid in producing warmth. The heat-producing power of fat in its natural state is over two and a half times as great as that of starch or sugar. The need of the body for food varies, but a relative idea is given of each. During *idleness* the usual requirement is (*a*) Flesh-producing food, 2.73 ounces. Heat-producing food, 20.60 ounces. (*b*) During regular *work*: Flesh-producing food, 4.48 ounces. Heat-producing food, 26.44 ounces.

Bread, meat, potatoes and milk are valuable foods, because they combine these different kinds of food.

Beans, with pork added to furnish fat, very nearly represent meat.

Indian meal has much of the strength of meat, and is rich in oil. It is a nutritious and economical food. It requires long boiling and to be carefully stirred into the water while being prepared. When fried in slices it makes a hearty food.

Of breadstuffs, wheat bread is the best, if it is rightly made of good flour. Heavy bread, because of its difficult digestion, is bad. Warm, light biscuit, well baked and well chewed, are not indigestible. Brown bread is generally made of bran and inferior grades in flour. Many foods disagree, because they are too rapidly eaten. Hurry in eating must be avoided.

MEATS.—Of these, beef and mutton are the most valued foods. Good veal and good pork, if well cooked and properly chewed, so that the fibers get into the stomach in a cut condition, digest quite readily. Tough fiber of any kind of meat needs to be made tender by keeping or pounding, or to be finely divided by chopping. Soup is a very valuable kind of food, and should be oftener used by laborers as the beginning of a meal.

FISH, as compared with butchers' meat, has about half as much of flesh-forming material. Most kinds lack in oil, but it is a nutritious food.

EGGS AND MILK do not need to be enforced as good foods. Cheese, if made of milk, is good as an addition to a usual meal.

VEGETABLES.—Potatoes are of very different quality. They are so much a dependence that more care should be taken in their selection and cooking, so that when cooked they may not cut like soap.

The tomato—half fruit, half vegetable—is very valuable to the laborer, because it cheaply supplies a juice much like that of some fruits which are more expensive. Cabbage, parsnips, carrots and onions rank high among vegetables as nutrients. Turnips are a relish to some, but not so nutritious. The onion contains 4.5 per cent. of carbon, 0.22 of nitrogen, and its oil stimulates digestion. Parsnips, carrots and beets have much sugar in their juices. All these are most digestible when cooked without grease, and properly oiled or seasoned afterward. As all artificial sugars are expensive, we get them best through our foods. As children convert the starches into sugars less rapidly, they need more molasses or other sweets with food than do adults.

DRINKS.—So far as nutriment is concerned, milk has the preference. Skimmed milk only lacks cream, which is supplied by other oils eaten. Buttermilk, by its acid, often aids digestion. Warm drinks aid digestion independently of their composition. Whatever is palatable and harmless may be added.

Tea is slightly refreshing, but not so valuable as coffee. This is not only invigorating, but the hot infusion is equally serviceable against cold and heat; in the one case the warmth, and in the other the action on the skin, are useful, while the nervous stimulation is desirable.

A warm drink at dinner is often valuable for those who carry a cold dinner with them, and is provided in some factories.

We need not discuss the alcoholic beverages as related to labor. The alcohol in them has no nutritious power, and their stimulus or exhilaration is not needed in healthful life. The matter of cost, as compared with any of the other foods or drinks, shows them to be too expensive to be included in any dietary for the laboring classes. This is conceded even by those who would advocate their use in times of extreme fatigue akin to disease. Beer, as used by the working classes in some localities, is a cutting down of daily wages as real as if a reduction was made by employers, and is not necessary.

The use of TOBACCO is so common that we only speak of its mode of use. It is best after meals. Constant smoking or chewing, when at work, injures many. Irregular heart action, nervousness and imperfect digestion often result. The pipe, when coated with the oil of the tobacco, is itself an evil. Each workman should guard against excessive use of tobacco. Young men and boys should not use it, and those who are older and have not the habit, have no need to acquire it.

As working people suffer much from adulteration of tea, coffee, tobacco, spices, baking powders, cheese and from other inferior foods, all factory cities should have analysts to test such frauds.

All simple, nutritious well cooked foods should be at the command of those who work, and none should so certainly get the worth of their money, and not waste money on inferior foods. The families of all workmen need to know of the various forms of foods furnished, and to acquire skill in their proper preparation. This home work, done by those who keep the house and provide the supplies, is a part of skillful labor.

COOKERY.—Health depends so much on good cooking that all house and home keepers should make of it a study. The chief design of cooking is to make foods tender,

or, in some cases, more palatable. "There are but few foods which require to be cooked in boiling water." A heat not over 180 degrees, instead of 212 or the boiling point, is usually enough for meat, milk, eggs and soup. The reason is that the albumen which these contain coagulates at this temperature, as we see it in the white of a cooked egg, and is made hard and less digestible if the heat is that of the boiling point. The cook easily knows when water is boiling, and by custom can regulate this. Vegetables require more heat, although some of these, when just done, are made more tender by steaming or simmering. Meat for boiling is sometimes dropped into boiling water in order to coagulate the surface and retain the juices, and then the temperature reduced by adding water and boiling at a lesser heat. Meat, which is warmed up, as in stews, should never come to a boil. When possible, bones should be removed from meat before roasting, and kept for soups.

Bread requires an even temperature in baking. If it is at all doughy, it is not so easily digested. Yeast and the better kinds of baking powders enable us to have it good, which is very important to all classes.

Times of Eating.—As food is a relative thing, dependent on the demands made upon us, the quality of food and the times of taking it vary somewhat. While regular hours for eating are desirable, and habits of eating without indication undesirable, yet a piecemeal, when there is over-fatigue or when the former meal has been light, is often advantageous. Nuts, cakes, candies and fruits, as a rule, are not useful when the stomach is empty and needs refreshment. At such times light bread or eggs or soup is better, while the former may be taken at or soon after meals. Those at work in preparing foods often suffer from too frequent eating. Labor, sleep, food, all need to be adjusted to each other, and those who observe are apt to find out how to proportion them.

Clothing.—Flannel is so valuable to working people, because it is an equalizer between the heat of the body and its surroundings. If it becomes very compact by pressure or long wear, or is soiled, it loses much of its value. Under-clothing of any kind should not be worn too long, as it and the skin are the great means of cleanliness, and so must be kept clean. The blouse and overalls are of great value as a protection to clothing, and should be adopted in most factories. It has been shown that very compact fiber, or that which becomes pressed or greasy by use, is not as warm as that which is looser and frequently aired and cleansed. No part of the clothing should be worn too tightly. Waistbands and suspenders should be elastic. Much harm is done by garters to those who are much on their feet.

Dress serves to protect the breast more than the back. We forget that the lungs are equally near each. The workman's vest should be as thick on the back as the front. In winter or changeable weather a strip of narrow smooth flannel inside the neck band of the outer shirt is a protection, better than large woolen mufflers about the throat. In changing from hot, close factories to the outer air a closed mouth and covered shoulders protect from many a cold. All workmen who stand or sit at work need especial care as to dryness of feet. If caps are worn at work, they should always be of light and airy material. Not only is the right temperature of the whole body a matter of comfort, but it is related to vital force, to capacity for work and to the demand for food. We crave fats and hearty food more in cold weather, because we consume more heat. While we regulate the supply by internal means, we must also, by artificial protection and adjustment, regulate our demands, and through these have our needs met. Dust, over heat and imperfect ventilation are the great perils of indoor labor.

As rest and recreation, and even change of activity, refresh and interrupt the wearing routine of daily toil, they are to be provided for. Only they must be such as do not, by any excess of food or drink of exposure or of fatigue, limit the value of the change.

American workmen have some great advantages for healthy living, and need to study how to avail themselves of those they have, and how to secure such others as they ought to have. It is a common interest of the State, that health, character, industry and skill, which are the four corner-stones on which prosperity is builded, should be secured; that there should be adequate provision for them, and that those who desire and need them should, for themselves, study and practice the conditions and methods most likely to secure them. Therefore, a personal *forethought* and oversight as to the necessary conditions of health, in *yourself*, in your workshop, in your occupation, in your home and for your family, is urged upon your attention.

CIRCULAR XLII.

AS TO PETROLEUM, KEROSENE, ETC.

The law of this State as to the use of illuminating oils, has done much to exclude from the market inferior grades of oil. This Board is now able to secure the co-operation of the wholesale dealers of the State, and with the aid of Local Boards of Health, can protect the people from explosive oils. The last Legislature, by the act, chapter XCVII., laws of 1883, so changed the law as to use only the flash test. Section one is as follows:

1. Be it enacted *by the Senate and General Assembly of the State of New Jersey*, That hereafter, petroleum, or any of the products thereof, may only be sold for use within this State under the following regulations and restrictions, namely, *(a)* benzole, gasoline, naphtha and benzine must be sold under their true names respectively, and such names must be plainly shown upon the barrel, can or vessel in which the same are sold, or offered or exposed for sale, respectively, or upon a label securely fastened thereto. *(b)* petroleum or kerosene which will flash at a less temperature than one hundred degrees Fahrenheit, flash test, must have plainly designated upon the barrel, can, or vessel in which the same is sold, or offered or exposed for sale, or on a label securely fastened thereto, the number of degrees Fahrenheit flash test, below which the same will not flash. *(c)* only such product of petroleum as will not flash at a less temperature or flash test than one hundred degrees Fahrenheit may be sold for lighting or illuminating purposes, except where the same is to be used in street lamps or open air receptacles, or in gas machines, in which case (as to petroleum or kerosene) there shall be plainly marked on the barrel, can or vessel in which the same is sold, or offered or exposed for sale, or on a label securely fastened thereto, the words, "not for inside light;" *provided*, that this act shall not apply to petroleum or its products sold in tanks used for transportation.

This law takes effect July 4th, 1883.

See also penalty as follows, sec. 2, 1882.

2. *And be enacted*, That if any person shall sell, or offer or expose for sale, for use within this State, except in the manner permitted by this act, any petroleum or product thereof, he shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine not exceeding five hundred dollars, or imprison-

ment at hard labor or otherwise for a term not exceeding one year, or both; and any sale in quantity less than one barrel shall be presumed to be for use within this State.

As the work of testing can be done better by using a closed tester, we have adopted the same oil tester that is approved by the New York Board. Eimer & Amend, 201 Third Avenue, New York City. The following rules are adopted to govern the use of the tester:

Remove the oil cup and fill the water-bath with cold water up to the mark on the inside. Replace the oil cup and pour in enough oil to fill it to within one eighth of an inch of the flange joining the cup and the vapor chamber above. Care must be taken that the oil does not flow over the flange. Remove all air bubbles with a piece of dry paper. Place the glass cover on the oil cup, and so adjust the thermometer that its bulb shall be just covered by the oil.

If an alcohol lamp is employed for heating the water-bath, the wick should be carefully trimmed and adjusted to a small flame. A small Bunsen burner may be used in place of the lamp. The rate of heating should be about two degrees per minute, and in no case exceed three degrees.

As a flash torch, a small gas jet ¼ inch in length, should be employed. When gas is not at hand employ a piece of waxed linen twine. The flame in this case, however, should be small.

When the temperature of the oil has reached 85° F., the testing should commence. To this end insert the torch into the opening in the cover, passing it in at such an angle as to well clear the cover, and to a distance about half way between the oil and the cover. The motion should be steady and uniform, rapid and without any pause. This should be repeated at every two degrees rise of the thermometer until the temperature has reached 95°, when the lamp should be removed and the testing should be made for each degree of temperature until 100° is reached. After this the lamp may be replaced if necessary, and the testings continued for each two degrees.

The appearance of a slight bluish flame shows that the flashing point has been reached.

In every case note the temperature of the oil before introducing the torch. The flame of the torch must not come in contact with the oil.

The water-bath should be filled with cold water for each separate test, and the oil from a previous test carefully wiped from the oil cup.

Not less than one pint of the oil to be tested should be sent to the examiner. It must be accompanied by the name of the person sending it and by the name of the person from whom it was obtained, both of which, if necessary, are confidential. Expressage must be prepaid.

Local Boards are urged to collect samples in their districts, and to impress on all buyers and sellers the importance of this protection from dangerous or hazardous oils. Samples sent by Local Boards will be examined without charge.

For convenience the State is divided into sections.

Testing for Bergen, Morris, Passaic, Sussex and Warren counties will be done by Wm. K. Newton, M. D., of Paterson; for Essex, Hudson, Middlesex and Union counties by Prof. A. R. Leeds, of Hoboken; for Hunterdon, Somerset, Mercer, Monmouth and Ocean counties by Prof. H. B. Cornwall, of Princeton, and for Atlantic, Burlington, Camden, Gloucester, Cape May, Cumberland and Salem counties by Shippen Wallace, of Burlington.

In the second report of the Board of Health (1878), pages 16–22, and the fourth report (1880), pages 25–28, and the fifth report, pages 22 and 106, the need of legislation upon the subject is illustrated. These are but items in the records of destruction of human life which has occurred from a substance which is safe and valuable for lighting purposes, if properly prepared. Fire and destruction of property often result from use of kerosene. The law which has been passed is the extreme limit of leniency,

and its value depends on its rigid enforcement. We shall have the co-operation of many of the manufacturers, and only need the aid of Local Health Boards and retail dealers to make it fully operative.

It will be the duty of all Local Boards of Health to see to it that the people in their respective districts are protected in the manner and to the degree which the law provides. Besides the notice given by the State Board of Health and in the newspapers, it will be wise for Local Boards to send copies of this circular, which can be had on application by postal to us, to all venders of or dealers in illuminating oil in their respective districts.

All dealers are held responsible that the oil which they are selling for household illuminating purposes is proper for use by the test and method of testing herewith adopted. Any person who can prove that he has bought oil of a less grade "for inside light" may bring suit. Purchasers of oils to be sold in this State should have the guaranty that the oils purchased are such as will answer the test herein given, and should not, when purchasing from refiners outside the State, rely upon the brand, but ask the written guaranty of the dealer.

In case of any accident occurring from the *actual explosion* of any lamp or can containing oil, the Local Board of Health should at once procure specimen and evidence as to its source and have the same tested by one of the analysts. Even where accident has resulted from the improper use of oil, as in lighting fires, the rapid explosion often results from gas present in the can or the intense inflammability of the oil.

All cities should employ a local inspector, who, if need be, can be duly authenticated by this Board. Besides the oversight of Local Boards we shall use proper methods for discovering the qualities of kerosene offered in the market and the sources from which it comes. It is to the interest of all that a safe kerosene be used. Heretofore, the production of a poor article has made an unfair competition, which it is hoped to overcome since life and health are endangered and fair dealing is prejudiced thereby.

It will be well for all retail dealers, in purchasing at wholesale, to have their bills certify that the oil purchased is up to the grade now required by the laws of New York and New Jersey.

E. M. HUNT, *Secretary*.

CIRCULAR XLIII.

Inclosed herewith please find an outline for the Annual Report for the year ending October 1st, 1883. Under the schedule of subjects for Report, in the case of cities and townships enumerated in the 6th Report (1882), pages 151–154, it will not be necessary to repeat as to *A*, *B*, *E*, *G*, *I*, *O*, as most of the facts are on file.

Under *A*, in the case of all cities or incorporated towns, it is desirable to report the number of acres included in the incorporation.

C. State exact source of water-supply. If a public supply, is it by the city or a private company? How many houses take it? Is the water ever discolored? Has it an iron or other taste? Is it hard or soft? Is it bad at any one season of the year? Are reservoirs or water pipes cleansed? Does the source or stream from which it is taken receive any sewage above the point of supply? Any other facts as to source, quantity or quality. How many depend on wells? How many on cisterns?

D. As to drainage, state whether any system of drainage for the ground is used as

distinct from sewerage. Is the usual water level such as to secure dry cellars? If there are swamps near you, or malaria is frequent, give particulars.

As to *sewers*, state their construction, their grade or fall per 100 feet, their size, their outfall, their flushing and ventilation, and whole length.

F. State whether houses generally have basements or cellars. If a city, whether the basements are occupied; if country, whether largely used for storage of vegetables. How many tenement houses of more than two families?

H. State how far sewers are used. If cesspools, state whether they are cemented, or whether built with open bottom and sides. How are they emptied?

J. State any known or prevalent diseases. Does assessor inquire each year as to losses of animals and contagious diseases? If a city, is there a register of all persons keeping horses, cows, hogs, etc.

K. Are slaughter houses inspected so as not to be a nuisance to neighbors?

L. State any new manufactories, and any evil to health therefrom.

Look carefully at each heading and state what you know.

Do not put down a disease a prevalent unless you have personally known of at least ten cases. Often the physician of the Board should make out or aid in the report, add such suggestions as occur to him; but between yourself and him let there be no delay to make return during October. We must trust chiefly to the assessor and the physician to keep the other members of the Board acquainted with health condition, and with the rights and duties of the Board. Any neglects reported to us will be inquired into. Refer to Circular XXXIX., before sent you, for further suggestions. We send also this month list of physicians that you may cross off any deceased or removed, or who have left practice. Add all new ones who have *settled* for practice in your city or township. Give name and *post office address*, etc., *plainly*, and only those who are practitioners and who *reside* within the limits you represent. Mail all to us, in envelope herewith sent, by November 1st.

E. M. HUNT, *Secretary*.

NOTE.—All these and other Circulars can be had in large print on application by postal.

References to Health Laws and Circulars will be found on pp. 31-34 of this Report and pp. 253-260 of 6th Report.

MEDICAL REGISTRY.

This list of physicians living and practicing in the State of New Jersey, is furnished in accord with section 2, of a supplement to an act entitled "An act to regulate the practice of medicine and surgery," approved March 12th, 1881, said supplement having been passed March 22d, 1883:

2. *And be it enacted*, That in order to secure to the State Board of Health a full record of all physicians and surgeons who, under the laws of this State, are required to give certificates of death, it shall be the duty of the county clerk of each county of the State, to furnish to the State Board of Health, a list of the names of all physicians and surgeons who have deposited with him copies of their diplomas, together with the date of their respective diplomas, and the name and place of the institution purporting to confer such diploma, and each county clerk shall yearly furnish to the State Board of Health a similar list of those physicians and surgeons hereafter depositing diplomas with him, and shall include in such list also the names of those physicians and surgeons filing affidavits with him, as mentioned in the second section of this act; and each county clerk shall keep in a suitable book, an index of the names of all physicians and surgeons depositing diplomas or filing affidavits in pursuance of this act or the acts to which this is a supplement; and for every name indexed and furnished to the State Board of Health as hereinbefore provided, the county clerk so indexing and furnishing such name, shall be entitled to receive from the State Board of Health, through its secretary, the sum of six cents.

In addition to the usual information as to laws passed, the Board has sought to acquaint each practitioner in the State with the law. Some had, under a law previous to 1880, filed their diplomas, but as no index had been kept, there was no means of securing a registry except by a refile of all former diplomas, and a filing of all new ones. As the law of 1880 makes no exception as to those who had diplomas on file beforehand, and a subsequent supplement speaks not only of those that commence, but of those who continue to practice without

conforming to the law of 1880, and always says, "shall" file and not "shall have" filed, medical men have, as a rule, so understood it; about 1,800 have filed under the law.

If any physician having a diploma from any chartered medical college, has, by ignorance of the law, failed to record, or if any one having filed a diploma under any former law, has failed to conform to the law of 1880, and the supplements thereto, the oversight should be immediately remedied. The law does not seek to discriminate between practitioners of different sects, or to assume that all who have filed diplomas are competent, but it does assume that any person who offers services requiring education and skill by announcing himself as a physician, shall have such form of attestation as this law provides. While it is the mildest form of restraint upon irregular practice which so often endangers the lives and health of citizens, it warns both those who attempt charlatanry and the people against the penalties and risks involved. We give the lists as furnished by the county clerks, in the order of the counties, and in the order of the names, which are not always alphabetically arranged.

ATLANTIC COUNTY.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY
Stille, Samuel	Egg Harbor City	Mar. 12, '75	University of Penna., Phila.
Boysen, Theophilus H	Egg Harbor City	Feb. 24, '74	University of Buffalo, N Y
Ingersoll, Denman Bevis	Mays Landing	Mar. 11, '65	University of Penna, Phila.
North, Joseph H.	Hammonton	Sept. 2, '35	University of Bowdoin, Me
Martin, Richard Allen	Atlantic City	Mar 12, '79	University of Penna, Phila.
Kirkpatrick, Alexander	....	Mar. —, '61	University of Penna, Phila.
Wright, Willard	Atlantic City	Mar. 14, '67	University of Penna, Phila.
Crosby, Obed. H.	Atlantic City	Mar. 5, '74	Hahneman College Phila
Somers, Job Braddock	Linwood	Mar. 15, '59	Jefferson College, Phila., Pa.
Abbott, Griffith E.	Tuckahoe	Mar. 14, '79	University of Penna, Phila.
Waters, Talcott P.	Absecon	Mar 13, '69	University of Penna, Phila
Souder, Charles	Atlantic City	July 10, '52	College of Medicine, Phila.
Harris, George M.	Port Republic	Feb. 19, '75	College of Medicine Phila
Edmonds, Samuel C.	Linwood	Mar. 8, '51	Jefferson College, Phila, Pa
Brown, Louisa (midwife)	Hammonton	Feb. 8, '78	University of Penna, Phila.
Reed, Thomas K	Atlantic City	Mar. 12, '64	University of Penna, Phila.
Reed, William Boardman	Atlantic City	Mar. 15, '78	University of Penna, Phila.
North, James	Atlantic City	Mar. 13, '80	Jefferson College, Phila, Pa.
Nivison, Oziel	Hammonton	Mar. 1, '77	Eclectic Med College, N. Y.
Armstrong, L. H.	Atlantic City	Mar. 13, '71	Jefferson Med College, Phila.
Hunter, David	Atlantic City	Mar. 12, '78	Jefferson College, Phila, Pa.
Youngman, Maurice D	Atlantic City	Mar. 5, '80	Hahneman College, Phila
Jessop, Samuel A. S.	Atlantic City	Mar. 12, '79	Jefferson College, Phila., Pa.
Hyde, Anna M. (midwife)	Hammonton	Feb 14, '78	University of Penna, Phila
Hallowell, Rebecca C.	Atlantic City	Mar. 14, '78	Woman's Med. College, Phila

ATLANTIC COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Cary, John E	Lower Bank	Sept. 16, '62	Columbia College, New York.
Fleming, John R	Absecon	Mar. 14, '82	Hahneman College, Phila.
Bennett, Henry Hudson	Atlantic City	May 13, '81	Columbia College, New York.
Wootton, William	Atlantic City	Mar. 14, '82	Hahneman College, Phila.
Neff, Joseph S	Atlantic City	Mar. 11, '75	Jefferson College, Phila., Pa.
Bennett, William H	Atlantic City	Mar. 13, '69	University of Penna., Phila.
Kollock, Matthew H	Atlantic City		Affidavit—20 years' practice.
Murray, James Munro	Atlantic City	Mar. 10, '76	University of Penna., Phila.
Stewart, Henry Knox	Atlantic City	Feb. 27, '69	Hahneman College, Phila.
Bartine, David Wesley	Ocean City	Mar. 11, '72	Hahneman College, Phila.
Crosby, George W	Atlantic City	Feb. 28, '78	Homœopathic College, N. Y.
Pollard, William	Atlantic City	Mar. 30, '82	Jefferson College, Phila., Pa.
Purcell, John C	Atlantic City	Mar. 30, '82	Jefferson College, Phila., Pa.
Nichols, Caroline G	Weeksville	Mar. 10, '76	University of Penna., Phila.
North, William McK	Atlantic City	Apr. 2, '83	Jefferson College, Phila., Pa.
Peebles, J. M	Hammonton	Oct. 19, '76	University of Penna., Phila.
Hale, William H	Atlantic City	Mar. 30, '82	Jefferson College, Phila., Pa.
Sheppard, John E	Atlantic City	Mar. 15, '82	University of Penna., Phila.
Reiley, Edward Anderson	Atlantic City	Mar. 8, '81	University of New York.
Backus, Boardman P	Atlantic City	Mar. 6, '81	Eclectic Med. College, N. Y.
Gill, Charles	Mays Landing		Affidavit—40 years' practice.

BERGEN COUNTY.

Ayers, Melancthon S	Fairview	June 2, '71	Long Island Col., Brooklyn.
Badeau, C. W	Ramsey	Mar. 6, '69	University of New York City.
Crary, Henry A.	Closter	Jan. 9, '66	Albany Med. College, N. Y.
De Mund, John T	Ridgewood	Mar. 12, '64	University of Penna., Phila.
Francis, William	Ridgewood	Mar. 1, '70	Bellevue College, N. Y. City.
Hunt, Hoit Eben		Mar. 1, '82	Eclectic Med. Col., N. Y. City.
King, Keneth Kirk	Rutherford	Mar. 1, '77	Bellevue College, N. Y. City.
Lowry, Charles	Hackensack	Mar. 3, '63	Homœopathic College, Phila.
Morris, Frederick	Cresskill	Mar. 9, '42	University of New York City.
Neer, Henry C	Park Ridge	Nov. 20, '60	Berkshire Med. Col., Mass.
Parker, George B	Ridgewood	Feb. 20, '47	Buffalo University, N. Y.
Richter, Augustus	Carlstadt	Nov. 14, '62	University Liepsic, Germany.
St. John, David	Hackensack	Mar. 1, '75	Bellevue College, N. Y. City.
Turnure, Milton	Closter	Mar. 11, '78	University of New York City.
Van Dyck, Cornelius C	Ramsey	Mar. 28, '42	Med. Soc. Schoharie Co., N Y.
Williams, Augustus P	Rutherford	Sept. 11, '60	Columbia College, N. Y. City.
Zimmerman, Edwin	Ramsey	Mar. 1, '79	University of Maryland, Balt.
Burdett, Abraham S	Hackensack	Mar. 4, '52	University of New York City.
Casey, James H	Carlstadt	Mar. 1, '75	Columbia College, N. Y. City.
Demarest, Cornelius L	Arcola	May 1, '79	Bellevue College, N. Y. City.
Flowers, Millard F	Ramsey	Mar. 1, '73	University of Maryland, Balt.
Hopper, Henry A	Hackensack	Mar. 6, '57	Albany University, N. Y.
Luckey, Mrs. Annie		Mar. 1, '65	Med. Col. for Women, N Y.
McGiffert, William C	Carlstadt	Mar. 13, '81	Columbia College, N. Y. City.
Phelps, Jeremiah W	Rutherford	June 18, '46	Caselton College, Vermont.
Reid, Thomas	Closter	Mar. 15, '76	University of New York City.
Soper, Oliver	Lodi	Mar. —, '78	Eclectic College, N. Y. City.
Taylor, William H. O	Ridgefield	Mar. 8, '81	University of New York City.
Wells, John A		Feb. 8, '79	Columbia College, N. Y. City.
Zabriskie, Simeon J	Westwood	Mar. 9, '61	University of New York City.

BERGEN COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Baldwin, Theodore H.	Hackensack	Mar. 4, '75	Homœopathic Med Col., N Y.
Campbell, George		Mar. 18, '82	University of New York City.
Hollister, Horace H.	Rutherford	June 5, —	Long Island Col., Brooklyn
Luck, John T.	Closter	Feb. 8, '68	Columbia College, N. Y. City.
Phillips, Cyrus B.		Mar. 1, '82	University of Maryland, Balt.
Smith, Benjamin F.	Hackensack	Mar. 4, '80	Eclectic Med Col., N. Y. City.
Zabriskie, Guilliam A.	Ridgewood	Oct. 11, '81	Columbia College, N Y City.
Brown, George E.	Hackensack	Mar 1, '75	Columbia College, N. Y. City.
Cogswell, William B	Hackensack	Mar. 10, '81	Bellevue College, N Y City
Huger, Joseph	Hackensack	Mar. 12, '80	Columbia College, N Y. City.
Latour, Isidore P.	Fort Lee	Mar. 1, '69	Columbia College, N Y City.
Stephens, Jacob J	Tappantown, N.Y	Oct. 4, '46	Albany University, N. Y
Burr, Henry N		Aug. 25, '63	Albany Med. Society, N. Y.
Clendenen, Alexander	Fort Lee	Mar. 7, '59	University of Maryland, Balt.
Hopper, John W.	Hackensack	Feb 8, '79	Columbia College, N. Y City.
Baldwin, D A.	Englewood	Mar. —, '49	University of New York City.
Currie, Daniel A.	Englewood	Feb. 9, '64	University of Buffalo, N Y.
Bogert, Albert O.	Pearl River, N. Y.	Mar. 1, '75	Columbia College, N Y City.
Badger, Merritt O.	Closter	June 9, '81	University of New York City.
Banks, Hardy M.	Englewood	Mar. 5, '51	University of New York City.

BURLINGTON COUNTY.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Ashurst, Francis	Mount Holly	Mar. 14, '67	University of Penna., Phila.
Bennett, John P.	Mount Holly	Mar. 11, '65	University of Penna., Phila.
Bispham, Charles W.	Mount Holly	Mar. 15, '78	University of Penna., Phila.
Barrington, Richard C.	Mount Holly	Mar. 30, '82	Jefferson Med. College, Phila
Brown, John C.	Vincentown	Mar. 14, '79	University of Penna., Phila.
Bullock, Lawrence M.	Jacobstown	Mar. 12, '81	Jefferson College, Phila., Pa.
Baker, Charles A.	Florence	Mar. 9, '67	Jefferson College, Phila., Pa.
Chamberlain, Wm. Jr.	Mount Holly	Mar. 12, '77	University of Penna., Phila.
Caley, Samuel	Mount Holly	Mar. 11, '76	Hahneman Med. Col., Phila.
Calver, George W. H.	Columbus	Dec 22, '62	Eclectic Med College, Phila.
Carey, John E.	Lower Bank	Sept. 16, '62	Columbia College, N. Y. City.
Clark, S. G.	Tuckerton	Mar. —, '68	Med. University, N. Y. City.
Clay, George B. L.	Moorestown	Mar. 1, —	Homœopathic College, Phila.
Currie, Joseph J.	Columbus	Mar. 1, '68	Homœopathic College, Phila.
Cox, Newton C.		Apr. 13, '83	University of Penna., Phila.
Downs, Jesse.	Marlton	Apr. 12, '75	University of Penna., Phila.
Dey, Charles L.	Crosswicks	Feb. 28, '72	Columbia College, N. Y. City
Duvall, Augustin W.	Beverly	Mar. 10, '77	Jefferson College, Phila., Pa.
Elwell, Alexander	Vincentown	Apr. 3, '47	University of Penna., Phila.
Fehr, Levi Decker	Bordentown	Mar. 10, '73	Hahneman Med. Col., Phila.
Frankish, Joseph		Mar. 13, '80	Jefferson Med. College, Phila.
Frankish, John		Mar. 12, '81	Jefferson Med. College, Phila.
Gauntt, Franklin	Burlington	Apr. 3, '47	University of Penna., Phila.
Grigg, Jacob	Pemberton	Mar. 31, '43	University of Penna., Phila.
Goodell, George.	Sykesville	Mar. 26, '35	University of Penna., Phila.
Hyatt, P. Fernando.	Bordentown	Mar. 2, '65	(College name not legible)
Hall, G. E.	Riverton	Mar. 12, '78	Jefferson College, Phila., Pa.
Hollingshead, Enoch	Pemberton	Mar. 14, '67	University of Penna., Phila.
Haines, Franklin.	Rancocas	Mar. 2, '67	Homœopathic College, Phila.
Hall, Harrison B.	Riverton	Feb. 27, '69	Homœopathic College, Phila.
Helton, John		Feb. 22, '60	Eclectic Med. College, Phila.

BURLINGTON COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Jemison, P. L	Bordentown	Mar. 7, '5[illegible]	University of Penna., Phila.
Janney, Joshua L	Cinnaminson	June 30, '65	Starling Med. Col., Col, O.
Longstreet, Henry H	Bordentown	Mar. 29, '42	New York University.
Laning, Elwood S	Burlington	Mar. 22, '49	New York University.
Melcher, William P	Pemberton	Mar 10, '76	University of Penna, Phila.
Maines, Elias Q	Sykesville	Mar. 1, '27	Columbia College, N. Y. City.
Moore, C. Howard	Juliustown	Apr. 27, '67	Eclectic Med. College, Phila.
Moore, John H	Tuckerton	Mar 15, '80	University of Penna., Phila.
Martin, William L	Rancocas	Mar. 6, '52	Jefferson College, Phila., Pa.
Marcy, Alexander Jr		Mar. 15, '80	University of Penna, Phila.
McNorth, William K		Apr. 2, '83	Jefferson College, Phila. Pa.
Nichols, Charles G	Green Bank	Apr. 10, '80	University of Penna., Phila.
Parsons, Richard C	Mount Holly	June 15, '80	University of Penna., Phila.
Parry, William C	Mount Holly	Mar. 9, '72	Jefferson College, Phila., Pa.
Patterson, Austin H	Georgetown	Mar. 1, '73	University of New York City.
Pugh, J. Howard	Burlington	Apr. 3, '52	University of Penna., Phila.
Page, Richard H	Columbus	Apr. —, '50	University of Penna, Phila.
Price, Theopilus T	Tuckerton	Mar. 5, '53	Medical College, Phila., Pa.
Parrish, Joseph	Burlington	Apr. 4, '44	University of Penna., Phila.
Pearsall, John C	Riverside	Mar. 30, '82	Jefferson College, Phila. Pa.
Reeve, Josiah	Medford	Mar. 14, '63	University of Penna., Phila.
Reeves, William M	Tuckerton	Mar. 12, '70	Jefferson College, Phila., Pa.
Roberts, James B	Beverly	Mar. 10, '73	Hahneman College, Phila.
Rink, Eugene F	Burlington	Mar. 8, '77	Hahneman College, Phila.
Sharp, Edgar B	Tuckerton	Mar. 9, '76	Hahneman College. Phila.
Shaw, Amos G	Jacobstown	Mar. 12, '63	Columbia College, N. Y City.
Sharp, L. L	Medford	Mar. 12, '64	University of Penna, Phila.
Shipps, William H	Bordentown	Mar. 15, '78	University of Penna., Phila.
Stroud, P. VanBuren	Marlton	Mar. 14, '61	University of Penna., Phila.
Stroud, Joseph C	Moorestown	Mar. 6, '51	Jefferson College, Phila., Pa.
Shreve, Joseph	Burlington	Feb. 21, '66	University of Penna., Phila.
Stokes, N. Newlin	Moorestown	Mar. 14, '61	Jefferson College, Phila., Pa.
Taylor, Addison W	Beverly	Mar. 14, '71	University of Penna., Phila.
Townsend, Ellis P	Beverly	Mar. 10, '63	Jefferson College, Phila., Pa.
Thornton, Samuel C	Moorestown	Apr. 3, '52	University of Penna., Phila.
Towne, Edwin C	Florence	Mar. 12, '73	Jefferson College, Phila., Pa.
Van Rensselaer, ——	Burlington	Mar. 13, '69	University of Penna, Phila.
Van Mater, Daniel G	Columbus	Mar. 1, '75	(College name not legible).
Vandervere, George W	Medford	Mar. 10, '73	Hahneman College, Phila.
Warrington, Joseph	Moorestown	Mar. 27, '28	University of Penna., Phila.
Ward, Walter	Mount Holly	Mar. 6, '40	Jefferson College, Phila., Pa.
Woodruff, William L	Columbus	Mar. 14, '82	Hahneman College. Phila.
Whitehead, John G. L	Bordentown	Feb. 28, '52	Phila. College of Medicine.
Werner, Mariam B		Mar. 10, '80	Phila. College of Medicine.
Whitehead, Willett W	Bordentown	Mar. 10, '81	Hahneman Col. of Medicine.
Wilson, Pusey	Moorestown	Mar. 3, '62	Homœo. College of Medicine.
White, Robert	Beverly	Mar. 15, '80	University of Penna., Phila.
Wheeler, Harry	Delanco	Mar. 13, '83	Hahneman College. Phila.
Young, Irene D	Bordentown	Mar. 7, '48	(College name not legible).*
Yeager, Jacob R	Burlington	Apr. 15, '69	Hygei's Thera College, N. Y.
Zeitler, Augustus E	Jacobstown	Mar. 2, '67	Homœopathic College, Phila.

CAMDEN COUNTY.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Armstrong, James A.	Camden		University of Pennsylvania.
Andrews, Parnell W.	Camden		Penna. Col. Hom Medicine.
Ashmead, Albert S.	Camden	Mar. 13, '69	Pennsylvania University
Aldrich, Herbert E.			Hahneman College.
Bryant, J. Kemper	Camden	Mar. 1, '56	Penna Col. Hom. Medicine.
Beall, Philip W	Camden		Jefferson College
Bartine, David H.	Merchantville		Pennsylvania University.
Bramn, Henry E.	Blackwoodtown		Jefferson College
Blackwood, Thomas R.	Camden		Hahneman College.
Benjamin, Dowling	Camden		Pennsylvania University.
Blake, Duncan W	Gloucester City		Jefferson College.
Boughman, George W.			Jefferson College.
Belden, O. S.	Camden		Pennsylvania University.
Barber, Isaac A.			Hahneman College.
Bethell, John P.			Pennsylvania University.
Browning, Walter C			Jefferson College.
Bringhurst, William			Jefferson College.
Bean, Samuel T	Camden	Mar. 30, '82	Jefferson College of Penna.
Barrett, Albert R.			Nashville Univ. of Tennessee.
Backus, B. P.			(College name not legible).
Bell, Edward H		Mar. 11, '75	Jefferson College.
Cooper, Clark T.	Camden	Feb. 18, '68	Hom Med Col of Penna.
Carles, Samuel.	Camden		Hom. Med Col. of Penna.
Clauson, Jacob E.			Baltimore College
Collins, Edwin			Pennsylvania University.
Cox, Henry	Camden		Jefferson College.
Davis, William Albert	Camden		Pennsylvania University.
Davis, H. H.	Camden		Jefferson College.
Donges, John W.	Camden		Pennsylvania University.
Du Bois, William G.			Hahneman College.
Dobson, Augustus T.			Pennsylvania University.
Eyre, Frank			Pennsylvania University.
Fortiner, George R.	Camden	——, '79	University of Pennsylvania.
Fortiner, Ida F.	Camden	——, '79	University of Pennsylvania.
Fullmer, John J.		Jan. 30, '58	Pennsylvania Eclectic Col.
Finlaw, J. Parker		June 16, '79	Kansas Eclectic College.
Finlaw, J. B		May 10, '79	Kansas Eclectic College.
Green, Charles W.	Camden	Oct. 24, '67	Dartmouth College.
Gross, Onan B.	Camden		University of Pennsylvania.
Godfrey, E. L. B.	Camden		Jefferson College.
Griffith, Anna E.			(College name not legible).
Gardner, Richard			Hahneman College.
Gardiner, Thomas U. W.			Hahneman College.
Gassaway, James M			Columbia College.
Gunter, Guilford H.			Pennsylvania University.
Howard, E. Melville	Camden		Hahneman College
Hugg, Isaac N.	Camden	Feb. 23, '69	University of Pennsylvania.
Hamilton, William A.	Camden		Baltimore College.
Hatton, Louis			Pennsylvania University.
Hunt, W H.	Camden		Massachusetts Academy.
Hunt, H. F.	Camden		Providence College.
Haney, J. R.	Camden		Pennsylvania University.
Hurff, Joseph E.			Jefferson College.
Hudders, C.			Jefferson College.
Hoell, Conrad G.	Camden		Pennsylvania University.
Hickman, O. H.			Jefferson College.

CAMDEN COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Halton, John	Camden		Pennsylvania Electrial Col.
Irwin, Samuel B	Camden		Jefferson College.
Izard, William H	Camden		Jefferson College.
Ireland, William H	Camden		Pennsylvania University.
Jennings, Napoleon B	Haddonfield		Jefferson College.
Johnston, Samuel H			(College name not legible).
Jones, J. H			New York University.
Jennings, James		Sept. 12, '40	Medical College, New York.
Kennedy, Samuel		Mar. 9, '70	Hahneman College.
Kitchen, George H		June 6, '70	Pennsylvania Electrial Col.
Leahy, Michael Morgan		Sept. 10, '60	University of Glasgow.
Leckner, John Davis	Camden		Hahneman College.
Mecray, Alexander M	Camden	Oct. 12, '65	University of Pennsylvania.
Mulford, Isaac B	Camden		University of Pennsylvania.
Middleton, M. F	Camden		Hahneman College.
Morgan, Randal W	Camden		University of Pennsylvania.
Otway, David B			Jefferson College.
Pancoast, D. Parrish	Camden		University of Pennsylvania.
Presley, Sophia		——, '79	Pennsylvania College.
Pfeiffer, G. S. F	Camden		Penna. Homœopathic Col.
Pratt, Lyndom M	Camden		Pennsylvania University.
Palm, Howard F	Camden		Jefferson College.
Peacock, Robert H			Hahneman College.
Pfeiffer, Frederick P	Camden		Philadelphia University.
Quint, Silas H	Camden		Hahneman College.
Rowand, Thomas G	Camden		University of Pennsylvania.
Ridge, James M	Camden		University of Pennsylvania.
Rosenstein, Simon			University of Pennsylvania.
Richards, Jennie			University of Pennsylvania.
Robinson, George Taylor	Camden		University of Pennsylvania.
Sheets, John A. J		Mar. 15, '80	University of Pennsylvania.
Stout, Daniel M			Jefferson College.
Shivers, C. Hendry			Jefferson College.
Shivers, Bowman H	Haddonfield		University of Pennsylvania.
Schellinger, Clarence M	Camden		Jefferson College.
Schenck, J. V	Camden		University of Pennsylvania.
Sharp, Edgar B			Hahneman College.
Smith, Henry A. M			Jefferson College.
Snowden, John W			University of Pennsylvania.
Snitcher, Elijah J	Camden		Chicago University.
Simon, Samuel H			Hahneman College.
Strock, Daniel			Jefferson College.
Smiley, E. R	Camden	Mar. 12, '81	Jefferson College.
Stanton, James G	Camden		Jefferson College.
Stanton, James H	Camden		University of Pennsylvania.
Stevenson, J. R			University of Pennsylvania.
Sutton, John W			Columbia College.
Taylor, H. Genet	Camden	Mar. 15, '60	University of Pennsylvania.
Tomlinson, Edwin	Gloucester City		Jefferson College.
Taylor, R. G			Jefferson College.
Tullis, Eli	Camden		Hahneman College.
Wroth, James H	Camden		University of Pennsylvania.
Wamsley, James A	Camden		Jefferson College.
Williams, Theodore S			Penna. Col. Hom. Medicine.
Walsh, Francis	Camden		University of Pennsylvania.
White, J. Orlando	Camden		University of Pennsylvania.

CAMDEN COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Williams, Franklin E.			Hahneman College.
Woolston, E. B.			University of Pennsylvania.
Waggoner, John S.			University of Pennsylvania.
Waters, Talcott P.			University of Pennsylvania.
Wescott, William A.		Apr. 2, '83	Jefferson College.
Warnock, William	Camden	Mar. 15, '80	University of Pennsylvania.

CAPE MAY COUNTY.

Abbott, Benjamin T.	Tuckahoe	(In Latin)	Jefferson College, Phila., Pa.
Bartine, David W.		(In Latin)	Hahneman Med. Col., Phila.
Carll, George G.	Dennisville	Mar. 13, '62	University of Penna., Phila.
Downs, Isaac M.	Cape May C. H.	May 16, '64	Phila. Eclectic Medical Col.
Davidson, David		(In Latin)	University of Pennsylvania.
Downs, Isaac M.	Cape May C. H.	(In Latin)	Jefferson College, Phila., Pa.
Gandy, Charles M.		Mar. 12, '79	Jefferson Med. College, Phila.
Hedstrom, William F.		Mar. 1, '74	Hahneman Med. Col., St Louis
Hand, John Holmes	Cape May C. H.	Mar. 24, '70	Eclectic Med. Col. of Penna.
Humphreys, Edward	South Seaville	(In Latin)	Hahneman Med. Col., Phila.
Ingram, Jacob H.		(In Latin)	University of Penna., Phila.
Kemble, James		(In Latin)	Hahneman Med. Col., Phila.
Kennedy, Henry A.	Cape May City	Mar. 13, '68	University of Penna., Phila.
Leaming, Walter S.	Cape May C. H.	Feb. 26, '76	Pa. Col. Dental Sur., Phila.
Leaming, Jonathan F.	Cape May C. H.	Mar. 24, '46	Jefferson College, Phila., Pa.
Leaming, Jonathan F.	Cape May C. H.	Mar. 1, '67	Penna. College Dental Sur.
Leaming, Walter S.	Cape May C. H.	Mar. 30, '82	Jefferson College, Phila., Pa.
Marcy, Milton Sumner		Mar. 5, '78	Chicago Medical College, Ill.
Mecray, James Jr.	Cape May City	Mar. 12, '65	University of Penna., Phila.
Marcy, Virgil M. D.	Cape May City	Mar. 10, '47	University of Maryland, Balt.
Marshall, Randolph	Tuckahoe	Mar. 10, '77	Jefferson College, Phila., Pa.
Marshall, Joseph C.	Tuckahoe	Mar. 11, '70	University of Penna., Phila.
Phillips, E. H.	Cape May City	Mar. 4, '68	Hahneman Med. Col., Phila.
Rosenstein, Simon		May 16, '71	Phila. Univ. Med. and Sur.
Swain, Humphrey	Goshen	(In Latin)	University of Penna., Phila.
Slaughter, James M.	Rio Grande	(In Latin)	Maryland Academy, Balt.
Way, Eugene	Dennisville	Mar. 12, '79	Jefferson Med. College, Phila.
Way, Palmer M.	Seaville	Jan. 27, '52	Albany Med. College, N. Y.
Wheaton, Theodore C.	Millville	Mar. 14, '79	University of Penna., Phila.
Wiley, John	Cape May C. H.	Mar. 11, '37	Jefferson Med. College, Phila.
Waggoner, John S.		(In Latin)	University of Penna.
Wheaton, Joseph C.	South Seaville	Apr. 2, '83	Jefferson Med. College, Phila.
Young, Alexander	Cape May City	Sept. 19, '59	Jefferson Med. College, Phila.

CUMBERLAND COUNTY.

Appelgate, William S.	Fairton	Apr. 2, '83	Jefferson College, Phila.
Bateman, Ephraim	Cedarville	July 4, '51	New Jersey Medical Society.
Bateman, Eli E.	Cedarville	July 6, '32	New Jersey Medical Society.
Holton, John	Bridgeton	Jan. 22, '60	Eclectic Med. College, Phila.
Newell, William L.	Millville	Mar. 15, '59	Jefferson College, Phila.
Smith, H. Clay	Millville	Mar. 14, '66	University of Penna., Phila.
Wiley, Charles	Vineland	Mar. 10, '64	Jefferson College, Phila.

CUMBERLAND COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Wade, John W., Jr.		Jan. 1, '76	Phila. Univ. Med. and Sur.*
Baker, Caroline A.		Mar. 9, '67	Jefferson College, Phila.
Backus, Boardman P.		Mar. 6, '81	Eclectic Med. College, N. Y.
Bennett, Jacob E.	Millville	Mar. 12, '81	Jefferson College, Phila.
Bateman, Elliston R.	Cedarville	Mar. 15, '82	University of Penna., Phila.
Bacon, Stetson L.	Port Norris	Mar. 9, '58	Jefferson College, Phila.
Bowen, John B.	Bridgeton	Mar. 14, '61	University of Penna., Phila.
Butcher, Joseph	Mauricetown	Apr. 2, '83	Jefferson College, Phila.
Conover, James V.		June 1, '80	Eclectic Med. Col., Cin., O.
Dare, Charles H.	Shiloh	Mar. 10, '70	University of Penna., Phila.
Decker, Corbin J.		Mar. 13, '70	Jefferson College, Phila.
Elmer, Robert W.	Bridgeton	Apr. 5, '60	Med. Society of New Jersey.
Ewing, Robert P.	Greenwich	Mar. 13, '68	University of Penna., Phila.
Elmer, William	Bridgeton	Sept. 6, '48	Med Society of New Jersey.
Elmer, Henry W.	Bridgeton	Mar. 13, '69	University of Penna., Phila.
Fleming, John R.		Mar. 14, '82	Hahneman College, Phila.
Fithian, Henry C.	Port Norris	Mar. 12, '77	University of Penna., Phila.
Farr, Eleazer D.	Cedarville	Jan. 20, '58	Eclectic Med. Col., Phila.
Foote, Theodore	Vineland	Mar. 5, '74	Hom. Med. College of N. Y.
Glanden, Andrew P.	Newport	Mar. 10, '65	Jefferson College, Phila.
Holmes, Ephraim	Greenwich	Apr. 4, '44	University of Penna., Phila.
Hill, Charles T.	Dividing Creek	Mar. 18, '81	Penna. Med. College, Phila.
Hyde, Anna M.		Feb. 14, '78	Phila. Univ. Med. and Sur.
Haley, George P.	Newport	Mar. 12, '79	Jefferson College, Phila.
Harris, George A.	Bridgeton	Dec. 20, '72	American University, Phila.
Ingram, John	Vineland	Feb. 25, '80	Sterling Med College, Col., O.
Jones, William S.	Millville	Mar. 12, '78	Jefferson College, Phila.
Jennings, James		Sept 12, '40	Reformed Med. Soc of N. Y.
Lucas, Mary		June 28, '53	Beach's Refor'd M. Col., Mass.
Lane, Franklin	Vineland	Nov. 11, '46	Berkshire Med. School, Mass.
Moore, Joseph	Bridgeton	Mar. 6, '52	Jefferson College, Phila.
Moore, John H.	Bridgeton	Mar. 15, '80	University of Phila.
McTaggart, Miles F.		Apr. 25, '65	Eclectic Med. College of Pa.
Paullin, George M.	Shiloh	Mar. 14, '61	University of Penna., Phila.
Potter, J. Barron	Bridgeton	June 26, '48	New Jersey Medical Society.
Putnam, Joseph H.	Bridgeton	Mar. 3, '64	Bellevue Col. of Med., N. Y.
Phillips, Charles C.	Deerfield	Feb. 26, '53	Phila. College of Medicine.
Streets, Jacob G.	Bridgeton	June 1, '66	Pa. Col. of Hom. Med., Phila.
Streets, David R.	Bridgeton	Mar. 15, '80	University of Penna., Phila.
Stathem, Thomas E.	Greenwich	Mar. 15, '60	University of Penna., Phila.
Smith, Thomas J.	Bridgeton	Mar. 14, '66	University of Penna., Phila.
Sturdivant, Thomas	Millville	Mar. 1, '60	Penna. Med. Univ., Phila.
Snyder, Sharp M.	Cedarville	Mar. 11, '65	University of Penna., Phila.
Shippard, Joseph	Bridgeton	July 4, '51	New Jersey Medical Society.
Tuller, Emery R.	Vineland	Feb. 7, '62	Western Hom. Col., Cleve., O.
Tuller, Malcom B.	Millville	Mar. 10, '73	Hahneman College, Phila.
Tomlinson, George	Roadstown	June 14, '31	New Jersey Medical Society.
Whitaker, Jonathan S.	Millville	Mar. 20, '45	Jefferson College, Phila.
West, Maxamillian	Millville	Mar. 12, '75	University of Penna., Phila.
Wright, Lucretia Minerva	Bridgeton	Mar. 5, '73	New England Female Col.
Willets, J. Howard	Port Elizabeth	Mar. 9, '58	Jefferson College, Phila.
Wilson, Stacy M.	Leesburg	Mar. 13, '69	University of Penna., Phila.
Wheaton, Theodore C.	Millville	Mar. 14, '79	University of Penna., Phila.
Woodruff, William L.		Mar. 14, '82	Hahneman College, Phila.

* Matriculate Jefferson Medical College.

ESSEX COUNTY.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Anderson, H. J		Mar. 4, '75	Hom. Med. College of N. Y.
Andrews, William J		Mar. 2, '65	Medical College of Ohio.
Alba, F. T		July 11, '46	Norwich University.
Annin, Jonathan		May 20, '29	Med. Society of New Jersey.
Ah, Peter Van			Sanitary Board.
Bailey, Charles H		Mar. 1, '69	Columbia College.
Bradin, Edward DeL		Mar. 12, '77	University of Pennsylvania.
Barnett, S. Amelia		Mar. 1, '65	N. Y. Med. Col. for Females.
Bayles, George		Mar. 8, '59	University of State of N. Y.
Bennett, Frederick W		Feb. 27, '78	Columbia College.
Bruyere, Walter Reeve		Mar. 1, '78	Columbia College.
Brundage, A. H		Mar. 7, '55	University of City of N. Y.
Berry, William B		Mar. 1, '76	Columbia College.
Baker, Walter S		Mar. 4, '63	Hom. Med. College of N. Y.
Brumley, John D		Mar. 2, '58	Med. College of New York.
Ball, Albert		Nov. 27, '72	University Wirzburg.
Burrage, Robert Lowell		Mar. 1, '78	Med. Col. of Bellevue Hosp.
Bleyle, Herman Conrad		Mar. 1, '68	Med. Col. of Bellevue Hosp.
Bradfield, Thomas R		Feb. 28, '70	Columbia College.
Burnett, Jacob B		Mar. 2, '66	Univ. of the City of N. Y.
Belmer, Randolph		Feb. 18, '78	Univ. of the City of N. Y.
Burdge, Paul Wesley		Mar. 26, '78	American Univ. of Phila.
Burling, John		Feb. 11, '74	Hosp. Col. of Hom., Cleve., O.
Baldwin, Aaron K		Feb. 26, '61	Univ. of the City of N. Y.
Buttner, Charles		May 26, '75	Med. Soc. of New Jersey.
Borts, Isaac		Mar. 1, '74	Med. Col. of Bellevue Hosp.
Blackelock, G. Clinton		Feb. 28, '78	N. Y. Hom. Med. College.
Bell, Wilson F		Mar. 10, '46	Univ. of the City of N. Y.
Baldwin, Milton		May 12, '46	Med. Soc. of New Jersey.
Bush, Eva		Aug. 18, '78	St. Em. Hosp., W. Is. (License).
Bergman, Mrs		Feb. 20, '74	C. of E. of M., Berlin (License).
Butler, Clarence W		Feb. 29, '72	N. Y. Med. Hom. Col.
Bruen, Julia M		Feb. 25, '81	N. Y. Eclectic Med. Col.
Boskowitz, George W		Oct. 7, '77	N. Y. Eclectic Med. Col.
Bachmann, Carl, (certif.)		June 7, '80	Soc. Hom. Hahne., Stuttgart.
Bennett, Charles D		May 13, '81	Columbia College.
Barrett, Albert R		Mar. 1, '77	University of Tennessee.
Baker, Frank Edwin		May 16, '82	Columbia College.
Bailey, Isaiah W		Aug. 20, '81	Electropathic Inst. of Phila.
Baldwin, T. H			N. Y. College of Hom. Med.
Chandler, William J		Feb. 28, '68	Columbia College.
Cusack, Thomas G		Feb. 16, '80	Univ. of the City of N. Y.
Cross, Jeremiah A		Mar. 10, '56	Albany Medical College.
Coursen, John W		Feb. 23, '42	Albany Medical College.
Christian, M. Osborne		Mar. 2, '78	Howard University.
Corwin, Joseph		Mar. 6, '35	Yale College.
Clark, Robert W		Mar. 11, '61	Univ. of the City of N. Y.
Corwin, Theodore W		Feb. 28, '76	Columbia College.
Clark, Augustus M		Mar. 27, '58	Univ. of the State of N. Y.
Campbell, Wellingt'n, Jr		Mar. 1, '77	Columbia College.
Casey, James H		Mar. 1, '75	Columbia College.
Clark, Jacob Henry		May 13, '81	Columbia College.
Currie, Margaret C		Mar. 1, '81	U. S. Med. Col. of N. Y.
Chambers, Talbot B		Mar. 1, '78	Columbia College.
Corrigan, Joseph		Mar. 1, '71	Columbia College.
Clarke, Margaret E		Aug. 23, '71	Med. Col. of N. Y. for Females.

ESSEX COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Crane, Henry Bedell		Apr. 13, '83	University of Pennsylvania.
Cort, Henry L.		May 25, '83	Columbia College.
Dill, Daniel M.		June 26, '67	University of Michigan.
Day, Fanny M.		Apr. 1, '80	Med. Acad of N. Y. for Fem.
Davis, Joseph A.		June 26, '40	Med. Soc. of New Jersey.
Darlington, Thomas		Mar. 12, '80	Columbia College.
Duncker, Frederick W.		Mar. 1, '66	Med Col. of Bellevue Hosp.
Dunker, John F.		Mar. 5, '57	Medical College of New York.
Dennis, Laban		Mar. 8, '66	Columbia College.
Duryee, John L.		Feb. 28, '66	Columbia College.
Dutcher, Benjamin C.		Sept. 25, '32	Med. Soc. of New Jersey.
Duffenbach, Rich'd G. P.		Mar. 3, '74	Columbia College.
Dougherty, Alexander N.		Mar. 6, '45	Univ. of the State of N. Y.
Dorn, Louise			Inst. Mid. of Jena (License).
Dressler, Anna F.		June 27, '78	Univ. of Leipzig (License).
Dougherty, Arthur C.		May 6, '82	Columbia College.
Delcourt, Adolph			Certificate.
Duncker, Charles Henry			U. S. Medical College.
English, Thomas D.		Apr. 5, '39	University of Pennsylvania.
Elliott, Jacob		Mar. 7, '50	Univ. of the City of N. Y.
Eyen, Anna Maria		Jan. 15, '75	N. Y. German Priv. Inst. of Midwifery (Certificate).
Elsasser, Wilhemine		Jan. 28, '63	Certif. of Dr. Jos. Kammerer.
Elliott, Daniel		Nov. 9, '80	Columbia College
Eaton, Samuel L.		Feb. 9, '82	Hahneman Medical College.
Franklin, Benjamin		Mar. 2, '60	Univ. of the City of N. Y.
Friess, Frederick		Mar. 8, '75	Hom. Med. College of N. Y.
Freeborn, Georgius C.		Feb. 27, '73	Columbia College.
Frazer, Samuel H.		Mar. 7, '70	Eclectic Med. Col. of N. Y.
Fewsmith, Joseph		Mar. 2, '74	Columbia College.
Fowler, Almira L.		Jan. 27, '53	Med. Col. of Pa. for Females.
Fonda, Edward S.		Mar. 5, '79	U. S. Medical College.
Falken, Alexander E. E.		———, '81	U. S. Medical College.
Forbes, Lucy S.		Mar. 29, '81	N. Y. Med. Col. for Women.
Falk, Barbara			G. D. School of Midwifery.
Francsovits, Theska			University of Vienna.
Gray, Thomas N.		Feb. 28, '79	Columbia College.
Gray, William R.		July 1, '67	Univ. of the City of N. Y.
Gillin, Robert F.		Feb. 17, '79	Univ. of the City of N. Y.
Grover, William B.		May 12, '45	Medical Soc. of New Jersey.
Gile, Francis A.		Mar. 4, '75	N. Y. Hom. Medical College.
Gill, Mrs. Rosa		Oct. 11, '81	G. O. M. I., N. Y., (Certif.).
Gedicke, Herman W.		Feb. 27, '82	Med. College of Evansville.
Graves, William B.		Feb. 17, '80	University of New York.
Garlner, Susanna		Aug. 29, '70	Certificate by A. Kriecher.
Guenther, Emil Ernest			Univ. of the City of N. Y.
Gerbert, H. P.			Col. Physicians and Surgeons.
Gray, Richardson			Columbia College.
Hester, Jacob		Apr. 1, '60	Penn Med. Univ. of Phila.
Howe, Edward J.		Feb. 27, '73	Columbia College.
Harvey, Thomas W.		Mar. 1, '78	Columbia College.
Haight, Trevonian		July 30, '64	Hosp. Col. of Long Island.
Holden, Edgar		Mar. 14, '61	Columbia College.
Hinds, Harriette C. Z.		Mar. —, '77	Eclectic M. C. of City of N. Y.
Hickey, Daniel C.		May 1, '64	Med. Soc. of the State of N. Y.
Herold, Herman C. H.		Mar. 1, '78	Med. Col. of Bellevue Hosp.

ESSEX COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Holloway, Henry D.		Feb. 26, '80	Eclectic Med. College of N. Y.
Hagar, John F.		Feb. 27, '73	Columbia College
Hewlett, P. V. P.		Mar. 2, '68	Univ. of the City of N. Y.
Hollister, L. Eugene		Mar. 26, '73	University of Michigan.
Hagen, Charles W.		Feb. 22, '61	Med. College of St. Louis
Haydon, J. H.		Feb. 20, '72	Univ. of the City of N. Y.
Hedges, Joseph		Mar. 8, '60	Univ. of the State of N. Y.
Haines, Ella		Mar. 15, '71	Med. Col. of Penna. for Fem.
Hunter, C. H.		Mar. 3, '57	Univ. of the City of N. Y.
Hitchcock, Wm. Edwin		Jan. 10, '86	Yale College
Holmes, William H.		Mar. 3, '59	Medical College of New York.
Heinrich, Johanna		Aug. 17, '65	Dr. J. T. Van Herder (License).
Hathaway, Maria Haring		Feb. 18, '70	New York Med. Eclectic Col.
Helf, Maria Ann		May 21, '40	I. of M., Trier, Ger. (License).
Hendry, Hugh Campbell		Mar. 1, '72	Bellevue Hosp. Med. College.
Hussey, Mary Dudley		Mar. 27, '77	Women's Med. Col., N. Y. Inf.
Hayward, Anna		Mar. 17, —	Med. Col. of Penna. for Fem.
Hess, Louise		Dec. 10, '72	Royal State Midwife School Wurtemberg, Ger. (Certif.)
Hedden, John H.		July 26, '82	University of Vermont
Heinsel, Rosalea			University Budapest, Hung.
Hudnut, Frank Parker		Oct. 1, '83	Bellevue Hosp. Med. Col.
Ill, Edward J.		Mar. 1, '75	Columbia College
Ill, Fredolin		July 10, '55	Medical Soc. of New Jersey
Iliff, Elias P.		June 21, '77	Long Island Hosp. College
Jones, S. Wesson		July 26, '72	Long Island Hospital Col.
Janes, John E.		May 1, '76	Med. Col. of Bellevue Hosp.
Johnson, William M.		June 30, '81	University of Michigan.
Johnson, Frank Walter		June 29, '70	Univ. (American) of Phila.
Kipp, Charles J.		Mar. 14, '61	Columbia College
Kent, George B.		Mar. 1, '67	Med. Col. of Bellevue Hosp.
Korneman, Henry A.		Feb. 28, '72	Columbia College.
Koehler, Maximilian		Apr. 16, '60	Med. Soc. of New Jersey.
Kramer, Gertruth		May —, '70	Dr. H. Hessler's Institute
Kiersted, Christopher		Dec. 30, '80	Med. Soc. of State of N. Y.
King, Joseph Henry		June 10, '71	American Univ. of Phila.
King, Joseph Henry		June 25, —	Eclectic College of Penna.
Kurz, Richard E.			(College name not legible).
Lyon, Ernest M.		Mar. —, —	Med. Col. of Bellevue Hosp.
Lyon, Selvan Smith		Feb. 13, '76	Eclec. Med. Col., City of N. Y.
Lane, Edmund R.		Mar. 1, '68	Hom. Med. Col. of N. Y.
Lehlbach, Charles F. J.		Mar. 6, '56	Univ. of the State of N. Y.
Love, J. J. H.		Mar. 7, '55	Univ. of the City of N. Y.
Lehmacher, Francis		Feb. 15, '64	University Greifswald.
Lauterborn, William F.		Feb. 13, '80	Univ. of the City of N. Y.
Lowerre, Thomas W.		May 9, '65	Columbia College.
Little, Herbert W.		June 27, '78	Yale College
Lounz, Maria		—— —, '62	Univ. Vienna (Certificate)
Lawrence, Elijah W.		Apr. 28, '83	Eclectic Med. Col. of Phila.
Lippa, John Jacob		July 9, '81	Univ. of the City of N. Y.
Maxwell, Thomas M.		Feb. 15, '75	Univ. of the City of N. Y.
Morgan, John C.		Feb. 14, '75	Univ. of the City of N. Y.
Munn, Charles W.		Mar. 10, '66	Jefferson College of Penna.
Mertland, William H.		Mar. 6, '73	University of Michigan
Mercer, Archibald		Mar. 6, '71	Columbia College.
Miller, John F.		July 27, '65	Long Island Hospital Col.

ESSEX COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Mandeville, Fred'k B....	....	Mar. 4, '63	Hom. Med. Col of N. Y.
Mun, Mary F..............	....	Mar. 21, '72	Med. Acad. of N. Y. for Fem.
Mershon, R. B..............	....	Mar. 5, '39	Jefferson College of Penna.
Mershon, Stacy B..........	....	Mar. 1, '74	Med. Col. of Bellevue Hosp.
Mills, Andrew M...........	....	June 7, '59	University of Vermont.
Mahr, Henry................	....	Aug. 14, '40	University of Munich
Meeker, George F..........	....	Jan. 25, '76	Eclectic Col. of New York.
McDermott, John R.......	....	Feb. 19, '77	Univ. of the City of N. Y.
Mulcahy, Dennis D........	....	Feb. 28, '72	Columbia College.
Muhlfeld, Henry	....	Oct. 1, '76	Med. Col. of Bellevue Hosp.
Mergott, Mrs. Hedwig ...	....	Aug. —, '79	Dr. Heinrich Hester (License).
Merz, Mrs. Henriette......	....	Nov. 28, '60	City of Hanau, Ger. (License).
Marsh, Stewart C..........	....	June 8, '37	Medical Soc. of New Jersey.
Murphy, Jane H...........	....	Nov. 1, '80	C. S. Lozier, M.D. (Certificate).
Mead, Isaac.................	....	Apr. 1, '28	Geneva College of New York.
Miller, Charles H..........	....	Mar. 2, '76	N. Y. Hom. Medical College.
Metcalf, Jewett............	....	Mar. 10, '75	Hahneman Medical College.
Mitchell, Charles P........	....	Nov. 12, '78	Royal Col. of Sur. of England.
Morris, Florillo B..........	....	Mar. 11, '65	University of Pennsylvania.
Mead, Sarah Rebecca......	....	June —, '83	Med. Col., City of New York.
Mueller, Louis E...........	....	....	(College name not legible).
Nichols, Edward P.........	....	Mar. 4, '52	Univ. of the State of N. Y.
Northrup, Emerson S......	....	Mar. 12, '79	N. Y. Med. of Hom. College.
Nimson, Anna T............	....	Mar. 23, '68	N. Y. Med. Col. for Women.
Newgeon, Mary F..........	....	Mar. 1, '81	U. S. Medical College.
Noger, Vincento	....	May 24, '82	N. J. Med. Soc. (Certificate).
Norton, Arthur B..........	....	....	Homœopathic Medical Col.
Osborne, Charles H........	....	Mar. 17, '79	Univ. of the City of N. Y.
Osborne, Edward A.......	....	Mar. 29, '48	Jefferson College of Penna.
Osborne, Joseph D	....	Mar. 8, '59	Univ. of the State of N. Y.
O'Gorman, William........	....	Jan. 17, '54	Royal College of Surgeons.
Pinkham, John Warren...	....	—— —, '66	Bellevue Hosp. Med. Col.
Peck, Edward E............	....	Mar. 1, '79	Bellevue Hosp. Med. Col.
Pierson, W., Jr.............	....	Mar. 9, '52	Univ. of the City of N. Y.
Pett, Jesse B................	....	Mar. 1, '70	Homœopathic Col. of N. Y.
Pindell, William N.........	....	Mar. 7, '48	Academy of Maryland.
Phelps, Eliza B.............	....	Apr. 2, '70	N. Y. Med. Col. for Females.
Poiner, Frances, *nee* Stanner	....	Aug. 30, '67	Karl Ferdinand University Prag, Austria (License).
Pfeiffer, Nicholas...........	....	Feb. 1, '63	Penn. Medical College.
Pennington, Samuel H...	....	May 1, '80	Medical Soc. of New Jersey.
Paine, Howard S...........	....	Mar. 3, '81	Albany Medical College.
Pilkin, Leonard F..........	....	June 19, '78	Univ. of the City of N. Y.
Pease, Charles E............	....	Mar. 15, —	University of Pennsylvania.
Pyrum, Mrs. Elizabeth...	....	....	(College name not legible).
Rankin, William............	....	Mar. 1, '71	Columbia College.
Robinson, Manning N....	....	Feb. 20, '60	University of Art of N. Y.
Rand, John M..............	....	Nov. 10, '58	Dartmouth College.
Ricord, Philip..............	....	Feb. 28, '68	Columbia College.
Robinson, Morton..........	....	—— —, '54	Metropolitan Med. College.
Robinson, W. R............	....	Mar. 5, '57	Univ. of the City of N. Y.
Ransom, A. A	....	Mar. 1, '67	Univ. of the City of N. Y.
Reed, Joshua W............	....	June 1, '67	Bellevue Hospital College.
Reul, Elizab'th, *nee* Held..	....	Dec. 21, '59	Governm't Nassau (License).
Robinson, George W......	....	Mar. 14, '67	Columbia College.
Reuss, Margaretta.........	....	Oct. 31, '75	M. I. Marburg, Ger. (License).

ESSEX COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Richards, George W		Mar. 4, '53	Univ. of the State of N. Y.
Rau, Jacob		Apr. 20, '49	Governm't Wurtemberg (Ger).
Roden, Hugh P		Mar. 10, '70	Missouri Medical College.
Roche, Gulielmus		Feb. 22, '81	N. Y. Eclectic Med. College.
Rolle, Eliza		Feb. 18, '81	Drs Gengenbacher & others (License).
Richert, Edward T		Mar. 14, '79	University of Pennsylvania.
Robinson, William D		Mar. 1, '59	Bellevue Hosp. Med. College.
Smith, William A		Jan. 26, '47	Geneva College.
Schureman, C. A		Mar. 1, '71	Univ. of the City of N. Y.
Schureman, A. J		Feb. 20, '72	Univ. of the City of N. Y.
Stickney, Charles W		Mar. 27, '58	University of Pennsylvania.
Smith, D. W		Mar. 7, '56	Univ. of the City of N. Y.
Stevens, Frederick H		June 18, '51	Medical College of Castleton.
Smith, D. S		Mar. 7, '55	Univ. of the City of N. Y.
Southard, Lott		June 22, '52	Geneva College.
Sutphin, Theron Y		Mar. 1, '73	Bellevue Hosp. Med. College.
Sutphin, R. M		Mar. 9, '47	Univ. of the City of N. Y.
Smith, E. Fayette		Mar. 1, '76	Columbia College.
Stiles, Anna M		Mar. 20, '73	Med. Acad. of N. Y. for Fem.
Staehlin, Robert		Feb. 27, '73	Columbia College.
Spreng, Justus J		Mar. 7, '64	Medical College of N. Y.
Skinner, D. M		Mar. 10, '58	Univ. of the City of N. Y.
Schaeffler, Ernest		July 22, '69	Fred'k Wilhelm Univ., Prus.
Seward, John L		Mar. 14, '67	University of Pennsylvania.
Sweet, Jonathan R		—— —, '54	Metropolitan Medical Col.
Schilling, William		May 7, —	New Jersey Hom. Med. Soc.
Staehle, Mrs. Louis		Oct. 17, '68	Dr. K. Jost, N. Y. (License).
Swords, George P		May 13, '81	Columbia College.
Schrewsbury, William J		Mar. 3, '81	Hom. College of New York.
Stickler, Joseph W		Feb. 28, '79	Columbia College.
Stillwell, John A		Mar. 9, '82	Howard University.
Simpson, James Y		May 16, '82	Columbia College.
Sweeny, D		Feb. 28, '82	Keokuk Medical College.
Schmitz, Caroline		Nov. 3, '76	Univ. of Giessen, Ger. (Certif.)
Sterling, Charles Fred'k		May 24, '79	Public Medical Col., Cin., O.
Stanwood, Robert Given		July 5, '78	Bowdoin College.
Shelton, Charles H		....	New York Hom. Med. Col.
Taft, Amanda W		May 15, '76	Eclec. Med. Col., City of N. Y.
Taft, Simon P		Feb. 3, '74	Eclec. Med. Col., City of N. Y.
Titus, William		Jan. 25, '66	Eclec. Med. Col. of Penna.
Taylor, Samuel W		Mar. 1, '62	Hom. Med. Col. of N. Y.
Thompson, Edwin B		Feb. 24, '57	Univ. of the City of N. Y.
Tichenor, H. H		Mar. 11, '54	Univ. of the City of N. Y.
Taylor, Elizabeth J		Mar. 25, '73	College of N. Y. Infirmary.
Thompson, David		Mar. 1, '69	Columbia College.
Tetreault, Francis J. E		Apr. 7, '80	Univ. of Bish. Col., Canada.
Treptow, Carl F. W		Feb. 22, '81	N. Y. Eclec. Medical College.
Taylor, John L		Mar. 1, '80	Bellevue Hosp. Med. College.
Thomas, B. Franklyn		Jan. 29, '78	Eclectic Med. Col. of N. Y.
Tompkins, Abraham W		....	Eclectic Med. Col. of N. Y.
Underwood, Charles F		Oct. 1, '74	Bellevue Hosp. Med. Col.
Van Duyn, S. W		Mar. 10, '65	Univ. of the City of N. Y.
Van Wagener, Geo. A		Mar. 1, '71	Columbia College.
Vail, M. H. C		June 22, '51	Castleton Medical College.
Vogler, Charles		May 25, '81	Med. Soc. of New Jersey.

ESSEX COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Wickes, Stephen		Mar. 27, '34	University of Pennsylvania.
Wyeth, Malborough C.		Mar. 1, '78	Columbia College.
Wright, Joseph R.		Feb 17, '79	Univ. of the City of N. Y.
Ward, Edwin M.		May 9, '62	Columbia College.
Ward, Emma C.		June 15, '70	N. Y. Hosp. Med Col. for Fem.
Ward, William S.		May 7, '49	Med Soc of New Jersey.
Whittingham, Edward T.		Mar. 9, '52	Academy of Maryland.
Wrightson, James T.		Mar. 1, '78	Academy of Maryland.
White, William H.		Mar. 3, '60	Pennsylvania College.
Ward, Arthur		May 9, '48	Med. Soc. of New Jersey.
Ward, George Smith		Mar. 22, '49	Univ. of the State of N. Y.
Wynans, Henry D.		Mar. 7, '5[illegible]	Univ. of the City of N. Y.
Whitehome, Henry B.		Jan. 20, '74	Albany Medical College.
Wilmarth, Francis		Feb. 28, '68	Columbia College.
Wade, Joseph L.		Mar. 7, '50	Univ. of the City of N. Y.
Ward, Leslie D.		Feb. 28, '6[illegible]	Col. of Phys. and Surg., N. Y.
Whitehead, Ira C.		Nov. 20, '45	Berker Medical School.
Wallace, David L.		Mar. 1, '75	Bellevue Hosp. Med. Col.
Wright, Alfred S.		Mar. 1, '78	Columbia College.
Whitehead, Isaac P.		May 27, '74	N. Y Med. Eclectic College.
Wilder, Alexander		Jan 5, '81	U. S. Medical College.
Ward, Joseph B.		Feb. 27, '57	Med. Hom Col. of Penna.
Walton, Alfred		June 25, '79	Harvard University.
Ward, Jacob H.		Apr. —, '79	Victoria College.
Wilson, John Eastman		Mar. 15, '83	N. Y. Hom. Medical College.
Wallace, Daniel		Apr. 30, '83	Affidavit—40 years' practice.
Young, Charles		Mar. 8, '66	Columbia College.
Young, J. Coddington Jr.		Feb. 27, '73	Columbia College.
Yarnall, James H.			Eclectic Medical College.
Zeh, Charles M.		June 14, '48	Castleton Med. Col., Vt.

GLOUCESTER COUNTY.

Abbott, Clarence G.	Woodbury	Mar. 10, '79	Hahneman College, Phila
Ashcraft, John H.	Mullica Hill	Mar. 10, '55	Jefferson Med. College. Phila.
Backus, Boardman P.		Mar. 6, '81	Eclec. M. Col., Novi Chorari.
Baker, C. A.		Mar. 9, '67	Jefferson Med. College, Phila.
Beckett, Albert T.	Salem	Mar. 10, '73	Hahneman College. Phila.
Buckingham, Henry G.	Clayton	Mar. 3, '75	Columbia College, Phila.
Buzby, Benjamin F.	Swedesboro	Mar. 12, '77	University of Penna., Phila.
Carter, Reuben		Feb. 11, '79	University of Penna., Phila.
Chew, Edmund	Mantua	Mar. 9, '76	University of Phila., Pa.
Clark, Henry C.	Woodbury	Apr. 5, '53	University of Penna, Phila.
De Groff, Eugene E.	Mullica Hill	Mar. 12, '75	Jefferson Med. College, Phila.
Duffell, Charles	Clayton	Mar. 8, '62	Jefferson Med College, Phila.
Edwards, J. Gaunt	Williamstown	Mar. 1, '78	Bellevue H. M. Dept., N. Y.
Finch, Lemuel E.	Wenonah	Mar. 10, '79	Hahneman College, Phila.
Glover, William A.	Woodbury	Mar. 9, '76	Hahneman Med. Col., Phila.
Garrison, Charles F.	Camden	Mar. 12, '72	University of Penna., Phila.
Gardiner, Daniel R.	Woodbury	Mar. 15, '49	Hom. Med. Col, Phila.
Halsey, Luther M.	Swedesboro	Mar. 13, '80	Jefferson Med. College, Phila.
Heritage, J. Down	Glassboro	Mar. 14, '63	University of Penna., Phila.
Heritage, Paul S.	Mantua	Mar. 12, '72	University of Penna., Phila.
Iszard, Jacob	Harrisonville	Mar. 9, '70	Hahneman Med. Col., Phila.

GLOUCESTER COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Jackson, Winslow	Bridgeport	Mar. 8, '51	University of Penna., Phila.
Keasbey, John B.	Woodbury	Apr. 1, '54	University of Penna., Phila.
Laws, George C.	Paulsboro	Mar. 14, '71	University of Penna., Phila.
Lee, Thomas	Glassboro	Mar. 10, '76	University of Penna., Phila.
Lippincott, Joshua	Harrisonville	Feb. 9, '75	University of Phila., Pa.
Longacre, Joseph S.	Bridgeport	Mar. 27, '79	Eclectic Med. Col. of Penna. (Buchanan).
Miller, Samuel T.	Paulsboro	Apr. 8, '50	University of Penna., Phila.
Musgrave, John F.	Swedesboro	Mar. 6, '83	Hahneman College, Phila.
McGeorge, Wallace	Woodbury	Feb. 28, '68	Hahneman College, Phila.
McKelvey, Alexander J.	Williamstown	Mar. 4, '35	Jefferson Med. College, Phila.
Oliphant, Eugene T.	Bridgeport	Mar. 12, '73	University of Penna., Phila.
Porch, Albert	Clayton	Mar. 9, '67	Jefferson Med. College, Phila.
Reeves, Edward L.	Paulsboro	Mar. 5, '59	Med. Col. of Penna., Phila.
Reeves, Robert	Paulsboro	Apr. 2, '83	Jefferson Med. Col. of Penna.
Smith, Asa A.	Franklinville	Mar. 12, '64	University of Penna., Phila.
Stamback, Henry L.	Mullica Hill	Mar. 10, '79	Hahneman College, Phila.
Stanger, Samuel F.	Harrisonville	Mar. 12, '70	Jefferson College, Phila.
Trenchard Albert	Mantua	Mar. 12, '70	Jefferson Med. College, Phila.
Turner, Thomas B.	Glassboro	Mar. 12, '75	University of Penna., Phila.
Ware, John D.	Woodbury	Mar. 10, '76	University of Penna., Phila.
Weatherby, Joseph C.	Clarksboro	Mar. 31, '37	University of Penna., Phila.
Westcott, E. Seymour		Apr. 2, '83	Jefferson Med. College, Phila.

HUDSON COUNTY.

Abercrombie, William H.		Feb. 29, '72	Hom. Med. Col., New York.
Allen, Ulamor		Mar. 13, '80	Univ. of the City of N. Y.
Andrews, B. A.		Mar. 1, '69	Bellevue Hosp. M. Col., N. Y.
Adams, Hugh T.		Oct. 14, '69	Queen's Univ., Ireland (Surg.)
Adams, Hugh T.		Oct. 14, '69	Queen's University, Ireland (Med. and Midwifery).
Allers, Henry		Mar. 8, '81	Univ. of the City of N. Y.
Bucher, John B.		Mar. 1, '73	Bellevue Hosp. M. Col., N. Y.
Bell, Henry		Mar. 19, '74	Georgiopolitan College.
Bier, Sophie		Aug. 19, '78	Midwifery Inst., N. Y. City.
Bridgeford, Mrs.		June 11, '69	M. S., R. C. S., Edinburgh.
Bresgleb, William		Mar. 6, '81	U. S. Med. Col., N. Y.
Brickner, M. F.		Mar. 6, '54	Ec. Med. Col. of Pa., Phila.
Balmer, Randolph		Feb. 28, '78	Univ. of the City of N. Y.
Bradford, George A.		Mar. 1, '82	Eclectic Med. Col. of N. Y.
Bidwell, Horace Gilbert		Mar. 1, '72	Bellevue Hosp. M. Col., N. Y.
Brush, H. Mortimer		Mar. 1, '62	Univ. of the City of N. Y.
Backus, Boardman P.		Mar. 6, '81	New York Eclectic Med. Col.
Buffett, Edward P.		Oct. 8, '57	Col. of Phys. and Surg., N. Y.
Crosby, Henry L.		—— —, '54	Metropolitan Medical College.
Clawson, S. W.		Mar. —, '67	Univ. of the City of N. Y.
Cropper, Charles W.		Mar. 1, '76	Bellevue Hosp. M. Col., N. Y.
Culver, Daniel W.		Nov. 2, '43	Med. Col. of Castleton, Vt.
Cadmus, W. J.		Feb. 28, '70	Univ. of the City of N. Y.
Clark, Samuel W., Jr.		Mar. 3, '81	Hom. Med. Col., N. Y. City.
Craig, James		Mar. 4, '61	Univ. of the City of N. Y.
Cahill, Hugo H.		Feb. 19, '73	Med. Eclectic Col. of N. Y.
Chabert, Romeo F.		Mar. 9, '58	University of New York.

HUDSON COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Dickinson, G. K		Mar. 1, '77	Bellevue Hosp. M. Col., N. Y.
Derby, Nelson R		Apr. 18, '49	University of Buffalo, N. Y.
DeHart, Sarah E		Mar. 23, '70	Female Med. College, N. Y.
DeLamater, Chas. H., Jr.		Feb. 23, '81	New York Col. of Dentistry.
Durrie, William A		Feb. 28, '77	Hom. Med. Col., N. Y. City.
Dallas, Alexander		Mar. 11, '78	Univ. of the City of N. Y.
Dewey, Raphael P		June 20, '70	Eclectic Med. Col. of Penna.
Deraismes, Edward J		July 10, '82	Univ. of the City of N. Y.
Darlington, William L		Mar. 11, '75	Jefferson Med. College, Phila.
Exton, J. A		Mar. 8, ,66	Col. of Phys. and Surg., N. Y.
Eddy, H. McC		Mar. 9, '72	Univ. of the City of N. Y.
Elder, Lorenzo W		—— —, '47	Col. of Phys. and Surg., N. Y.
Everitt, John R		May 26, '72	Col. Hospital of Long Island.
Fry, Richard Watson		June 27, '72	University of Virginia.
Faber, John		Mar. 2, '75	Col. Fredk. & Alex., Bavaria.
Fisher, William R		Mar. 12, '67	Columbia College, N. Y. City.
Fuller, Madana B		Mar. 23, '68	Female Med. Acad., N. Y.
Fonda, Edward S		Mar. 5, '79	U. S. Medical College, N. Y
Glassford, Robert W		Mar. 1, '78	Col. of Phys. and Surg., N. Y.
Golding, J. Frederick		Mar. 1, '75	Columbia College, N. Y. City.
Gordon, Leonard J		Mar. 1, '75	Bellevue M. Col. Hosp., N. Y.
Giovanne, Marini E		—— —, '78	University Geneva.
Gedicke, Herman W		Feb. 27, '82	Med. Col. of Evansville, Ind.
Henke, Adelheid		Dec. 9, '79	Midwife Institute, N. Y. City.
Hoffman, A. C		Mar. 1, '76	Col. of Phys. and Surg., N. Y.
Hinchman, Melissa		Feb. 3, '78	Eclectic Med. Col., N. Y. City.
Heppenheimer, Fred'k C.		Mar. 18, '80	University, Bavaria.
Hornblower, Josiah		Mar. 9, '60	Univ. of the City of N. Y.
Helfer, Samuel Alexander		Mar. 14, '75	Univ. of the City of N. Y.
Haase, Henry W. A		Mar. 8, '76	Univ. of the City of N. Y.
Henry, John P		May 13, '81	Col. of Phys. and Surg., N. Y.
Hardenberg, D. S		May 28, '63	Albany Medical College.
Hoffman, Peter		July 9, '81	Univ. of the City of N. Y.
Hoff, J. A		Mar. 9, '69	Univ. of the City of N. Y.
Hammell, Philemon		Sept. 26, '82	Col. of Phys. and Surg., N. Y.
Hunt, Hart Eben		Mar. 1, '82	Eclectic Med. Col., N. Y. City.
Hillegas, Willard		Mar. 4, '81	Albany Medical College.
Hetzel, Charles J		Mar. 6, '80	Eclectic Med. Col., N. Y. City.
Hunt, John W		—— —, '59	Univ. of the City of N. Y.
Julian, John M		June 23, '80	Long Is. Col., Brooklyn, N. Y.
Johnson, William M		June 30, '81	Univ. of the State of Mich.
Kudlich, William Tell		Mar. 1, '76	Col. of Phys. and Surg., N. Y.
Keating, John		Mar. 1, '77	Bellevue Hosp. M Col., N. Y.
Kitchen, George H		June 6, '70	Eclec. Med. Col. of Pa., Phila.
Kyte, C. F		Mar. 8, '81	Univ. of the City of N. Y.
Kirk, Thomas Morris		Mar. 3, '83	Univ. of the City of N. Y.
Kreckler, Fredericka		Sept. 28, '69	I. L. I. & M. In., of Hanover.
Kopetchny, Otticar E		Mar. 11, '76	Jefferson College, Penna.
Leaybron, Anna A		Apr. 5, '76	N. Y. Free M. Col. for Women.
Lutkins, William C		Mar. 15, '76	Univ. of the City of N. Y.
Lutkins, Alfred A		Mar. 15, '78	Univ. of the City of N. Y.
Linneburner, Charles A.		Feb. 28, '79	Col. of Phys. and Surg., N. Y.
Lampson, Mortimer		Mar. 8, '66	Col. of Phys. and Surg., N. Y.
Lignot, Charles A. J		Mar. 15, '76	Univ. of the City of N. Y.
Lynch, Henry H		Mar. 11, '78	Univ. of the City of N. Y.
Laidlaw, Alexander H		Mar. 1, '51	Hom. Med. Col. of Pa., Phila.

HUDSON COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY
Long, Horace A	....	Mar 10, '81	Bellevue Hosp. M. Col., N. Y.
Lindorme, Charles A. F	....	Mar 2, '81	U. S. Med. Col., N. Y. City
La Rue, Frank E	....	July 9, '80	Univ. of the City of N. Y.
Lawrence, Elijah W	....	Sept 28, '63	Philadelphia Medical College.
Lynch, Thomas	....	Mar. 1, '79	Bellevue Hosp. M. Col., N. Y.
Lockwood, Hilliard L	....	Mar. 12, '79	Hom. Med. Col., N. Y. City
Lester, Frank W	....	Mar. 1, '78	Col. of Phys. and Surg., N. Y.
Lesser, Adolphus M	....	Mar. 1, '82	Eclectic Medical Col. N. Y.
Lutze, Frederick H	....	Mar. 16, '72	Hom. Med. Col., N. Y. City.
Molling, Peter Augustus	....	Mar. 11, '78	Univ. of the City of N. Y.
Mahalieu, A. W	....	Mar. 1, '75	Col. of Phys. and Surg., N. Y.
Manaton, J. P	....	June 23, '80	Brooklyn Medical Col., N. Y.
McBride, Lewis A	....	Mar. 1, '81	Bellevue Hosp. M. Col., N. Y.
McCallum, George B	....	July 1, '80	Univ. of the State of Mich.
McClellan, David	....	Mar. 14, '80	Hahneman M. Col., Chicago.
Meyer, George Irving	....	Mar. 1, '78	Col. of Phys. and Surg., N. Y.
McLean, Henrietta	....	Apr. 14, '77	Hyger's Therapeutic Col., Florence Heights, N. J.
Morris Stephen V	....	Nov. 1, '77	Bellevue Hosp. M. Col., N. Y.
Mabon, William	....	Aug. 1, '81	Bellevue Hosp. M. Col., N. Y.
McDowell, William J	....	Mar. 3, '74	University of Maryland, Balt.
Metcalf George R	....	Mar. 3, '74	Col. of Phys. and Surg., N. Y.
Means, V. C. B	....	July 9, '81	Univ. of the City of N. Y.
Moorehouse, Elias W	....	Mar —, '82	Univ. of the City of N. Y.
Muir, Henry C	....	Mar. —, '72	Univ. of the City of N. Y.
McNeil, C. Holmes	....	Feb. 29, '72	Hom. Med. Col., N. Y. City.
Newell, William H	....	Mar. 17, '59	M. D. Univ. of Pa., Phila.
Nichols, Francis	....	Mar. 1, '61	Pa. Hom. Med. Col., Phila.
Nast, Hugo	....	Mar. 9, '75	Jefferson Col., Phila., Pa.
Norris, H. Lee, Jr	....	Aug. 9, '70	Royal College, Edinburgh.
Ossa, Louis Philip	....	Feb. 24, '76	Wash. M. U., Baltimore, Md.
Olds, Edward	....	Feb. 28, '56	West. Hom. Col., Cleve., O.
Olsen, Grenada P	....	Mar. 3, '83	(College name not legible)
Pyle, Edwin W	....	Mar. 13, '73	University of Penna., Phila.
Paul, James	....	Apr. 30, '69	University of Glasgow.
Pape, Gotthold	....	Mar. 17, '80	Univ. of the City of N. Y.
Pitts, George Frederick	....	Mar. 10, '72	Univ. of the City of N. Y.
Peterson, Anna	....	Mar. 28, '76	Midwifery Inst., N. Y. City.
Parker, William J	....	Mar. 1, '79	Bellevue Hosp. M. Col., N. Y.
Pettigrew, F. W	....	Jan. 30, '45	Roy. Col. of Surg., England
Pryum, Elizabeth Gordon	....	Mar. 1, '82	Eclectic M. Col., New Jersey.
Payn, F. G	....	....	Jefferson College, Penna.
Pendergast, John J	....	Feb. 28, '68	Col. of Phys. and Surg., also Columbia Col., N. Y.
Peacock, Rufus W	....	June 15, '75	Univ. of the City of N. Y.
Rothe Charles G. H	....	Mar. 4, '80	Eclectic Med. College, N. Y.
Rae, Gualterum	....	Mar. 15, '76	Univ. of the City of N. Y.
Rue, Henry Bergen	....	Mar. 15, '80	University of Penna., Phila.
Reeve, Daniel L	....	Apr. 14, '45	Univ. of the City of N. Y.
Rein, Louis	....	May 24, '70	Med. Soc. State of New Jersey.
Roth, Edward	....	Mar. 1, '80	Bellevue Hosp. M. Col., N. Y.
Roe, Carrie L	....	Apr. 1, '74	N. Y. Med. Col. for Women.
Rector, Pierson	....	May 28, '63	Albany Med. College, N. Y.
Squier, M. Frederick	....	Feb. —, '72	Col. of Phys. and Surg., N. Y.
Shelton Charles H	....	Mar. 5, '80	Hom. Med. Col., N. Y. City.
Straughn, Frederick	....	Mar. 1, '70	Maryland Academy, Balt.

HUDSON COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Streubel, Julius		Mar. 4, '80	N. Y. Eclectic Med. College.
Smith, Henry M		Mar. 1, '71	Col. of Phys. and Surg., N. Y.
Stout, Stephen V. W		Feb. 28, '68	Col of Phys. and Surg., N Y.
Salter, Joseph Ely		Mar. 10, '81	Bellevue Hosp. M. Col., N. Y.
Simmons, Harris R		Mar. 8, '77	N. Y. Col. of Hom. Medicine.
Somerville, John Alex		Mar. 9, '82	Univ. of the City of N. Y.
Sherwood, Henry De L		May 16, '82	Col. of Phys. and Surg., N. Y.
Schul, Charles A. G		May 24, '82	Med. Soc. State of New Jersey.
Sommer, Ida		Oct. 23, '82	Midwife Institute, N Y. City.
Sacchi, Angelo		Nov. 15, '76	University of Naples.
Saltonstall, G. D		Mar. 6, '82	University of New York.
Seuftleben, Hugo H. E		Nov. 11, '54	Albertine Acad., Bradenburg.
Stoddard Freeman		Mar. 10, '64	Col. of Phys. and Surg., N. Y.
Smith, Fenimore Cooper		July —, '83	Univ. of the City of N. Y.
Toepper, Albert		Mar. 13, '74	Univ. of the City of N. Y.
Taylor, Paul I		Mar. 14, '75	Univ. of the City of N. Y.
Taylor, William H. O		Mar. 8, '81	Univ. of the City of N. Y.
Thomsen, James W		Mar. 10, '75	Hahneman Med. Col., Phila.
Van Vorst, John, Jr		Mar. 1, '74	Bellevue Hosp. M. Col., N. Y.
Vondy, Joseph H		Mar. 5, '51	Univ. of the City of N. Y.
Varick, William W.		June 1, '76	Bellevue Hosp. M Col, N. Y.
Van Mater, John H		Mar. 15, '80	University of Penna., Phila.
Van Saun, John D		Mar. 1, '73	Bellevue Hosp Med. College.
Viers, Charles Otho		Mar. 1, '67	Bellevue Hosp. Med. College.
Van Houten, Hard'nb'gh		Mar. 6, '83	U. S. Med Col., N. Y. City.
Varick, Theodore R		May 8, '49	Med. Soc. of New Jersey.
Wright, William G		Mar. 1, '76	Col. of Phys. and Surg., N. Y.
Waldmeyer, Joseph R		May 26, '75	Med. Soc. of New Jersey.
Wigg, Cuthbert		Mar. 1, '80	Bellevue Hosp. Med. Col.
Watson, William P		Mar. 1, '78	Col. of Phys. and Surg, N. Y.
Watson, B. A		Mar. 4, '61	Univ. of the City of N. Y.
Wolfe, Theodore F		Feb. 28, '68	Col. of Phys. and Surg, N Y.
Warner, William B		Mar. 9, '82	Univ. of the City of N. Y.
Ware, William Powell		Mar. 1, '83	Eclectic Med. Col of N. Y.
Williams, John		Mar. 1, '77	Col. of Phys. and Surg., N. Y.
Zabriskie, William A		Oct. 11, '81	Col. of Phys. and Surg., N. Y.

HUNTERDON COUNTY.

A'Heron, T. M	Junction	Apr. 7, '74	Lying-in Hospital of Coombe.
A'Heron, T. M	Junction	Mar. 10, '73	Univ. of the City of N. Y.
Brown, Robert S. P		Mar. 12, '81	Jefferson College, Phila
Berkaw, Willard E		Mar. 15, '81	University of Penna., Phila.
Best, George N.	Stockton	Mar. 12, '75	University of Penna., Phila.
Burd, Thos. B. J	Flemington	Mar. 10, '71	Hahneman Med. Col., Phila.
Bartow, George W	Clover Hill	Feb. 28, '72	Col. of Phys. and Surg., N. Y.
Burd, Thos. B. J	Flemington	Mar. 10, '71	Hahneman Med. Col, Phila.
Blane John	Perryville	Apr. 30, '27	Med Soc. State of New Jersey.
Closson, A. L		Mar. 21, '63	College of Medicine, Phila.
Creveling, W. S	Bloomsbury	Mar. 3, '51	Univ. of the City of N. Y.
Ewing, John H	Flemington	Mar. 1, '77	Jefferson Med. College, Phila.
Frace, J. McCormick		Mar. 12, '77	University of Penna, Phila.
Grandin, John F	Clinton	Apr. 3, '52	University of Penna., Phila.
Hart, A. M	Ringoes		Affidavit—Filed April 25, '83.

HUNTERDON COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY
Hoff, J. O	Bloomsbury	Mar. 6, '69	Univ. of the City of N. Y.
Hunt, Thos. E	Glen Gardner	Mar. 9, '47	Univ. of the City of N. Y.
Hunt, Thos. E	Glen Gardner	Mar. 1, '78	Bellevue Medical College
Harrison Samuel		June 12, '77	Univ. of the City of N. Y.
Jackson, David P		Mar. 2, '74	College of Miami, Cin., Ohio
Knight, Moses D	Little York	Mar. 24, '61	University of Pennsylvania
Leavitt, John F	Baptisttown	June 21, '81	Univ. of the City of N. Y.
Lowe, John N		Mar. 6, '62	Univ. of the City of N. Y.
Little, W. B	Bloomsbury	Mar. 15, '78	University of Penna., Phila
Lawrence, B. M		Dec. 26, '65	N. Y. Hygeio Thera. College.
Larison, George H	Lambertville	Mar. 27, '58	University of Penna., Phila
Miller, Frank W		Feb. 28, '73	University of Buffalo, N. Y.
Miller, Henry H		Mar. 7, '81	Univ. of the City of N. Y.
Miller, Theodore		Feb. 18, '73	Univ. of the City of N. Y.
McCaully, J. D.		Mar. 15, '59	University of Penna., Phila.
Oliphant, Nelson B		Mar. 15, '80	University of Penna., Phila.
Pursel, W. W		Mar. 11, '74	Jefferson College, Phila
Pittenger, A. S		Jan. 25, '70	Geneva Med. College, N. Y.
Pilkington, Horatio		Mar. 14, '79	University of Penna., Phila.
Ribble, George T	Milford	Mar. 1, '66	Bellevue Med. College, N. Y
Reiley, Asher		Mar. 14, '49	Univ. of the City of N. Y
Race, Henry		Mar. 31, '43	University of Pennsylvania
Romine, George D	Lambertville	Mar. 15, '80	University of Pennsylvania.
Robbins, J. V	Ringoes	Mar. 4, '59	University City of N. Y
Reading Miller K		Feb. 10, '76	Col. of Phys. and Surg. N. Y.
Rowland, George	Flemington	Mar. 5, '53	College of Penna., Phila.
Reed, Rufus	Lambertville	Mar. 10, '70	Hahneman Med. Col., Phila.
Schuyler, Richard W	Schooley's Mt	Mar. 3, '81	Hom. Med. Col., N. Y.
Snyder, Q. Emanuel		Mar. 1, '68	Med. Col. of Bellevue, N. Y.
Skillman, Thomas A	Quakertown	Feb. 17, '78	Univ. of the City of N. Y
Smith, A. Carpenter	Bloomsbury	Apr. 5, '50	University of Penna., Phila
Servis, Howard	Junction	—— —, '58	University of Pennsylvania.
Stiles, James E		May 10, '65	Med. and Sur. Univ., Phila.
Shannon, Albert		Mar. 12, '72	University of Penna., Phila.
Williams, William C		Mar. 8, '77	Hahneman Med. Col., Phila.
Wells, Joseph M		Mar. 12, '78	Jefferson College, Phila., Pa.
Wetherell, Horace G		Mar. 15, '78	University of Penna., Phila.
Young, Peter C	Ringoes	Mar. 13, '73	University of Penna., Phila.

MERCER COUNTY.

Brown, Charles C		Mar. 2, '59	College of Medicine, Phila.
Brock, Harry D		Mar. 20, '72	University of Penna., Phila
Bodine, Joseph L		Mar. 10, '65	University of Penna., Phila
Barwis, Elmer		Mar. 10, '73	University of Penna., Phila.
Bayles, John G		July 18, '47	Univ. of the City of N. Y.
Brigleb, William		Apr. 8, '41	Hessian Ludwig's Univ. of Giessen, Germany
Burton, Jacob W		Mar. 10, '77	Univ. of the City of N. Y.
Baker, Elias C		Jan. 7, '53	Medical School of Yale Col.
Boardman, Joseph C		July 4, '51	Med. Soc. of New Jersey
Bergen, Elston H		Mar. 1, '77	Col. of Med. and Surg., N. Y.
Battine, Oliver H		Mar. 5, '49	Med. Col. of Penna., Phila
Britton, Charles P		Mar. 10, '73	University of Penna., Phila.

MERCER COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Coleman, H. Waldburg		Feb. 28, '68	Col. of Phys. and Surg., N. Y.
Cooper, Isaac		Mar. 4, '80	Hahneman Med Col., Phila.
Compton, Charles B		Mar. 1, '54	Hahneman Med. Col., Phila.
Christine, William B		Mar. 12, '77	University of Penna, Phila.
Clark, William A		Mar. 14, '79	University of Penna, Phila.
Doud, Edward J		Mar. 3, '80	Col. of Med. and Surg, Balt.
Dewitt, Edmund		Mar. 9, '62	Univ. of the City of N. Y.
Dey, Addison H		Mar. 15, '81	University of Penna., Phila.
Davis, Irenaus S		Mar. 1, '71	Bellevue Hosp. M. Col., N. Y.
Dunham, Charles H		Mar. 12, '64	University of Penna., Phila.
Delaney, Alfred		——, '06	Mondingo Herb College.
Elmer, William		Oct. 7, '64	University of Penna., Phila.
Freese, Jacob R		July —, '51	Phila. Med. College, Pa.
Franklin, George H		Feb. 8, '74	Columbia Med. Col., N. Y.
Gerry, Charles W		Oct. —, '78	University Boston, Mass.
Griffeth, W. H. G			Hahneman Med. Col., Phila.
Green, William		Mar. 15, '60	University of Penna., Phila.
Gallagher, Patrick J		Mar. 6, '78	State University of Iowa.
Hutchinson, Robert C		Mar. 15, '78	University of Penna., Phila.
Hart, Israel		Mar. 4, '53	University of Penna, Phila.
Hart, Edgar		Mar. 14, '79	University of Penna., Phila.
Holman, H. R		Mar. 16, '72	Col. of Hom. Med., N. Y.
James, Jacob B		Apr. 30, —	Col. of Geneva, Switzerland.
Jackson, Moses J		Jan. 1, '80	Eclectic Med. Col of Penna.
Johnson, J. P		Mar. 2, '67	Hom. Med. Col., Phila., Pa.
Kirk, Enos L		Mar. 10, '80	Hahneman Med. Col., Phila.
Kirby, John		Apr. 3, '52	University of Penna., Phila.
Laning, J. T		Jan. 21, '63	Col. of Medicine of Phila.
Lalor, William S		Mar. 12, '72	University of Penna., Phila.
Lawrence, B. M		Dec. 25, '65	N. Y. Therapeutic College.
Laning, Joseph S		Feb. 21, '71	University of Buffalo, N. Y.
Lytle, William J		Mar. 8, '48	Univ. of the City of N. Y.
Lewis, Smith H		Mar. 15, '81	University of Penna., Phila.
Leavitt, Lyman		Mar. 6, '57	University of Penna., Phila.
Leavitt, Charles B		Mar. 15, '82	University of Penna, Phila.
Lloyd, Henry C		July 3, '48	University of Penna, Phila.
Maul, J. M		July 3, '76	Phila. Electropathic Inst.
Miller, John A		Feb. 22, '64	Eclectic Med. Col, Phila.
Mackenzie, Thomas H		Mar. 8, '71	Harvard Med. School, Mass.
MacDonald, Arthur K		Mar. 12, '75	University of Penna., Phila.
McCullough, William G		Mar. 11, '78	Hahneman Med. Col., Phila.
Moke, J. A		Mar. 9, '70	Hahneman Med. Col., Phila.
Nelson, Adonis			University of Penna., Phila.
Neil, Henry A. P		Mar. 12, '77	University of Penna., Phila.
Newell, William A		Mar. 12, '77	University of Penna., Phila.
Palmer, George M		Mar. 4, '80	Eclectic Col. of New York.
Paul, Sarah E		Mar. 13, '61	Female Med. Col. of Penna.
Phillips, W. W. L		Mar. 8, '55	Jefferson College of Penna
Rue, Henry B		Mar. 15, '80	University of Penna., Phila.
Reese, L		Mar. 14, '82	Medico Surgical Col., Phila.
Rankin, Robert M		Mar. —, '77	Univ. of the City of N. Y.
Rogers, Richard R		Mar. 13, '62	University of Penna., Phila.
Rogers, Richard Runyan		Mar. 15, '82	University of Penna., Phila.
Rice, William		— 15, '60	University of Penna., Phila.
Rhinehart, T. F. A		——, '49	Wurtzburg College, Germany.
Ribble, J. I. B		Mar. 3, '54	Col. of Phys. and Surg., N. Y.

MERCER COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Robbins, George R		Mar. 12, '70	Jefferson Med Col., Phila
Shafer, Herman		Mar. 13, '69	University of Penna., Phila.
Skellenger, Edward B		Mar. 1, '75	Col of Phys. and Surg., N. Y.
Stokes, Alfred C		Mar. 13, '69	University of Penna., Phila.
Shepherd, Cornelius		Mar. 15, '61	University of Penna., Phila.
Sackett Edward W		Mar. 14, '82	Hahneman Med. Col., Phila.
Steen, Alexander M		Mar. 15, '82	University of Penna., Phila.
Struble, Hugo Mc		Mar. 12, '75	University of Penna., Phila.
Satterthwaite Joseph H		Mar. 13, '83	Hahneman Med Col., Phila.
Schenck, J. Stillwell		Mar. 31, '43	University of Penna., Phila.
Titus George E		Aug. 1, '77	Bellevue Medical College
Tantum, James D		Mar. 15, '78	University of Penna., Phila.
Taylor, Sewell O. B		Mar. 12, '72	University of Penna., Phila.
Turner, Joseph		Mar. 12, '78	Jefferson College, Phila
Van Duyn, William B		Mar. 12, '66	Univ. of City of New York.
Wikoff, J. H		Mar. 4, '54	Univ. of City of New York.
Welling, E Livingston		Mar. 15, '60	University of Penna., Phila.
Wyckoff, W W		May 14, '64	Eclectic Med. Col. of Phila.
Williams, Frank H		Mar. 12, '74	University of Penna., Phila.
Ward John W		Mar. 14, '66	University of Penna., Phila
Williamson, Alexander		Mar. 25, '78	University of Penna., Phila.
Weeks, Henry M		Mar. 10, '73	University City of N. Y.
Woolverton, John		Apr. 7, '49	University of Penna. Phila.
Warman, David		Mar. 10, '62	Bellevue Med Col., N. Y.
Wilbur, Lloyd		Mar. 11, '54	Jefferson Med Col., Phila.
Worthington, Anthony		Mar. 1, '60	Penna. Hom Med. College.
Wilson, William V		July 11, '67	Yale Med. School, Conn
Young, James R		Mar. 13, '83	University of Penna., Phila.

MIDDLESEX COUNTY.

Andrus, C H	Metuchen	Mar. 6, '45	Col Phys. and Surg., N. Y.
Baldwin, Henry R	New Brunswick	Mar. 4, '53	Col. Phys and Surg., N. Y.
Barber, Edmond H	New Brunswick	Mar. 8, '77	Hom. Med College, N. Y.
Blackwell Lewis S	Perth Amboy	Mar. 8, '57	University of Pennsylvania
Bissett, Frederick W	Washington	Mar. 1, '76	Col Phys. and Surg., N. Y.
Bissett, John J	Washington	Mar. 12, '80	Col Phys and Surg. N. Y.
Baldwin, J. M	Dayton	Mar. 13, '80	Jefferson Med. Col., Penna.
Bertolet, E. B		Mar. 10, '76	University of Pennsylvania
Barchet, Stephen P	China	Mar. 4, '75	N. Y. Col. of Homœopathy.
Berhans, W M		Feb. 18, '75	University of Pennsylvania
Bates, Cornelius S		Jan. 3, '81	Eclectic Med. Col of Penna
Barber, Adelia B	New Brunswick	Apr. 3, '83	N. Y. Female Med Academy.
Clark, Staats V. D	New Brunswick	Mar. 2, '70	Col. of Phys and Surg., N. Y.
Clark, George G	New Brunswick	July 8, '79	Univ. of the City of N. Y.
Carman, J. H	South Amboy	Mar. 1, '81	Col Phys. and Surg., Balt.
Disbrow, Stephen M	Old Bridge	Mar. —, '77	Bellevue Medical College.
Decker, Dayton E	Woodbridge	Jan. 15, '74	Long Is. College Hospital.
Donahue, Francis M	New Brunswick	Mar. 8, '81	Univ. of the City of N. Y.
English, David C	New Brunswick	Feb. 28, '68	Col of Phys. and Surg., N. Y.
Everitt Edward	Woodbridge	Mar. —, '79	Hom. Med College, N. Y.
Fuchs, Maria	Milltown	May 1, '50	Heidelberg College
Freeman, Alonzo	South Amboy	Mar. 1, '69	Col. of Phys. and Surg., N. Y.
Follett, William M	New Brunswick	Mar. 1, '83	Eclectic Med. College, N. Y.

MIDDLESEX COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Geis, Rosalie	Woodbridge	May 31, '72	Royal School for Midwives, Weizburg, Bavaria
Garner, Henry B.	Spotswood	Mar. 1, '76	Col. of Phys. and Surg., N. Y.
Howard, Thomas T., Jr.	South Amboy	Mar. 5, '80	Hom. Med. College, N. Y.
Helm, John, Jr.	New Brunswick	July 11, '60	Univ. of the City of N. Y.
Hunt, Ezra M.	Trenton	Mar. 4, '52	Col. of Phys. and Surg. N. Y.
Hubbard William H.	Perth Amboy	Mar. —, '73	Bellevue Med. College.
Haight, Alfred M.		Mar. 7, '79	Hom. Med. College, N. Y.
Holmes, John C.	Cranbury	Mar. 10, '64	Col. of Phys and Surg., N. Y.
Hamilton, Ezra W.		Mar. 3, '81	Hom. Med. College, N Y.
Hunt, Alonzo C.	Metuchen	Mar. 13, '81	Col. of Phys. and Surg., N. Y.
Janeway, George J.	New Brunswick	Oct. 4, '39	Med. Soc. of New Jersey.
Keep, Caroline J.	Middlebush	Mar. 1, '67	Hom. Med. College, N Y.
King, Joseph H.		June 25, '67	Eclectic Med. Col. of Penna.
King, Joseph H.		June 10, '71	American Univ. of Phila.
Long, Samuel	New Brunswick	Mar. 10, '73	Hahneman Med. Col. Phila.
Lawrence, B. M.		Dec. 25, '65	Hygei's Thera. Col., N. Y.
Lewis, William C., Jr.	South Amboy	Mar. 5, '80	University of Pennsylvania.
Morgan, Lawrence O.	South Amboy	Mar. 9, '65	Col. of Phys. and Surg., N. Y.
Mabon, William	New Brunswick	Mar. 1, '81	Bellevue Med. Col., N. Y.
Norton, Horace G.		Mar. 15, '80	University of Pennsylvania.
Nelson, William J.	Dunellen	Mar. 12, '80	Col. of Phys. and Surg., N. Y.
Norton, Frank B.	Metuchen	Mar. 13, '74	Univ. of the City of N. Y.
Platt, Joseph H.	Dunellen	Mar. 1, '56	Penna. Hom. Med. College.
Rice, J. Warren	New Brunswick	Mar. 1, '75	Col. of Phys. and Surg., N. Y.
Reiley, Edward A.	Atlantic City.	Mar. 8, '81	Univ. of the City of N. Y.
Reed, Rufus	New Brunswick	Mar. 10, —	Hahneman Med. Col., Phila.
Stephens, David	New Brunswick	Nov. 24, '63	Berkshire Med. Col., Mass.
Skillman, Thomas A.	Quakertown	Mar. 11, '78	Univ. of the City of N. Y.
Slack, Clarence M.	New Brunswick	Mar. 10, '65	Jefferson Med. Col., Penna.
Sleeper, Thomas D.	Camden	June 6, '70	Eclectic Med. College, Penna.
Symmes, Henry C.	Cranbury	Mar. 14, '80	University of Pennsylvania.
Smith, John F.		Mar. 6, '67	Georgetown College.
Suydam, John L.	Jamesburg	Mar. 9, '82	Univ. of the City of N. Y.
Thompson, John C.	Washington	Mar. 6, '56	Col Phys. and Surg., N. Y.
Treganowan, Ambrose	South Amboy	July 1, '54	Phila. College of Medicine.
Vail, Duncan P.	Dunellen	June 2, '53	Vermont Medical College
Van Marter John S.	New Brunswick	Feb 21, '66	Med. and Surg Univ. of Pa.
Voorhees, Charles H.	New Brunswick	Mar. 9, '50	Jefferson Med Col. of Penna.
Verdi, Ciro S.	New Brunswick	Feb. 28, '61	N. Y. Col. of Homœopathy
Van Deventer, John L.	New Brunswick	May 13, '81	Col. of Phys and Surg., N. Y.
Wainwright, J. B.	Milltown	Mar. 1, '77	Col. of Phys and Surg. N. Y.
Wilson, J. G.	Perth Amboy	Mar. 10, '76	University of Pennsylvania.
Williamson, Nicholas	New Brunswick	Mar. 9, '71	Univ. of the City of N. Y.
Walton, Alfred	South Amboy	June 25, '79	Harvard University.
White, J. Leon	South Amboy	Mar. 12, '81	Jefferson Med College, Pa.
Wilson, G. V.	Monmouth Junc'n	July 18, '67	Yale College.
Zandt, H. D.	Jamesburg	Mar. 14, '81	University of Pennsylvania.

MONMOUTH COUNTY.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Alday, John H.	Ocean Grove	Mar. 1, '56	Col. Med. Hom., Phila., Pa.
Applegate, Asher T.	Englishtown	Mar. 13, '69	University of Penna., Phila.
Arrowsmith, Joseph E.	Keyport	Mar. —, '42	University of City of N. Y.
Archer, Hannah E.		Feb. 4, '60	Eclectic, New York.
Archer, William		Feb. 4, '60	Eclectic, New York.
Allen, Charles W.		Mar. 1, '78	Columbia College, N. Y.
Alba, F. T.		July 9, '46	Norwich University, now Lewis College.
Alday, Henry B.	Ocean Grove	June 15, '82	University of Penna., Phila.
Amony, Joseph D.		Mar. 1, '75	Columbia College, N. Y.
Beegle, I. Newton F.	Ocean Grove	Mar. 1, '70	Col. of Med. Bellevue Hosp.
Burhans, Laura M.		Feb. 19, '75	University of Med., Phila.
Burnett, William W.	Freehold	Mar. 1, '70	College Med. Hom., N. Y.
Bailey, Thomas H.		Mar. 1, '70	Col. of Med. Bellevue Hosp.
Brown, George W.		Feb. 28, '79	Columbia College, N. Y.
Buchanan, Alexander		July 10, '60	Med. and Surg., Glasgow.
Bennett, Henry Hudson.		Mar. 13, '81	Columbia College, N. Y.
Beach, William B.	Eatontown	Mar. 1, '75	Univ. of Maryland Med. Col.
Beck, J. Howard.		Mar. 15, '82	University of Penna., Phila.
Bissett, John J.		Mar. 12, '80	Columbia College, N. Y.
Burnett, D. Walton.		Mar. 4, '83	College Med. Hom., N. Y.
Chittenden, Daniel J.	Fair Haven	Mar. —, '59	Univ. City of New York.
Cheesman, Joseph K.	Red Bank	June 13, '43	Onondaga Soc. State of N. Y.
Crater, Elias Wolcott	Oceanport	Mar. 1, '78	Columbia College, N. Y.
Chattle, Thos. G.	Long Branch	July 1, '54	Phila. Col. Med. State of Pa.
Clark, Isaac J.		Mar. 9, '58	Jefferson College, Phila., Pa.
Cook, Henry G.	Holmdel	Mar. 5, '57	Col. Med. and Surg., N. Y.
Curry, George H.		Mar. 10, '80	Hahneman Med. Col., Phila.
Costell, Henry B.	Rocky Hill	Mar. 15, '82	University of Pennsylvania.
Coe, Henry Clark		Mar. 16, '82	Columbia College, N. Y.
Conover, Robert R.	Red Bank	Mar. 6, '47	University of City of N. Y.
Conover, James T.	Freehold	Mar. 1, '57	Col. of Med. Bellevue Hosp.
Chasey, Jacob	Long Branch	Mar. 1, '75	Columbia College, N. Y.
Desbrin, Vanderhoof M.	Farmingdale	July —, '80	Col. of Ag. Univ. of Vermont.
Davison, J. Franklin		—— —, '80	Univ. City of New York.
Des Angeles, Henry F.	Asbury Park	Jan. 4, '64	Med. Soc. of New Jersey.
Davis, Josephine G.		Mar. 15, '77	College of Medicine, Penna.
Desbrin, F. A.	Farmingdale	Mar. 1, '81	Col. of Med. and Surg., Md.
Dearborn, Henry M.		July 15, '69	Bowdoin College, Maine.
Duryee, Charles C.		Mar. 4, '81	Albany Medical College.
Davis, Edwin T.		Mar. 14, '82	Hahneman Med. Col., Phila.
Dessau, T. Henry		Mar. 7, '68	Jefferson College, Penna.
Ellison, Ozias		Mar. 4, '80	U. S. Medical College.
Evans, Mariam D. L.	Asbury Park	Mar. 1, '82	Eclectic Med. College, N. Y.
Evans, Samuel D.	Asbury Park	Mar. 1, '82	Eclectic Med. College, N. Y.
Field, Edwin	Red Bank	Feb. 27, '73	Columbia College, N. Y.
Forman, D. McLean	Freehold	Mar. 8, '66	Columbia College, N. Y.
Fay, George D.		Mar. 10, '81	Hahneman Med. Col., Phila.
Garrison, Henry W.	Asbury Park	Feb. 28, '78	College Med. Hom., N. Y.
Goodenough, Josephus B.	Long Branch	Mar. 4, '52	College of Med., City of N. Y.
Gardiner, Richard, Jr.		Dec. 6, '80	Hahneman Med. Col., Phila.
Green, James O.	Long Branch	Mar. 1, '66	Col. of Med. Bellevue Hosp.
Hetrick, Jacobus A. W.	Asbury Park	Mar. 9, '76	Hahneman Med. Col., Phila.
Howell, Alexander A.	Allentown	Mar. 1, '41	Jefferson Med. Col., Phila.
Hustis, C.	Ocean Grove	Mar. 5, '65	Univ. City of New York.
Hickson, Charles S.		Feb. 21, '50	Medical Col., Syracuse, N. Y.

MONMOUTH COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Humphreys, Frederick...		Mar. 2, '50	Col. Med. Hom., Phila., Pa.
Hendrickson Daniel D...	Middletown	Mar. 15, '80	University of Pennsylvania.
Hunt, Sylvester H	Long Branch	Mar. 10, '65	Jefferson Col. of Penna.
Hills Arthur T		Mar. 4, '75	College Med. Hom., N. Y.
Hunter, Jacobus B		Mar. 8, '66	Columbia College, N. Y.
Hughes, Henry	Long Branch	Feb. 27, '73	Columbia College, N. Y.
Hodgson, Wilmer		Mar. 5, '67	College, Richmond, Va.
Hubbard, William H	Red Bank	Aug. 1, '34	Med. Soc. of New Jersey.
Herbert, Ralph Willis		Mar. 3, '81	N. Y. Medical College Hom.
Hutchinson, George H...	Englishtown	Mar. 15, '80	University of Pennsylvania.
Hanks, Horace T		Dec. 23, '61	Albany Medical College.
Henry, Nelson H		Feb. 28, '79	Columbia College, N. Y.
Ingham, Harvey Alanson		Feb. 28, '82	Ec. Med. Col. City of N. Y.
Jones, Mariam A. D		Mar. 11, '75	College of Medicine, Penna.
Jackson, Andrew	Matawan	Feb. 25, '73	University of Buffalo, N. Y.
Janeway, Edward G		Mar. 10, '64	Columbia College, N. Y.
James, Jacobus B		Apr. —, '29	Geneva College, N. Y.
Janney, Thomsin		Apr. 9, '77	Medical Academy, N. Y.
Judson, Edward Allen		July —, '79	Univ. City of New York.
Johnson, Harris P	Allentown	Apr. 2, '83	Jefferson College of Penna.
Karsner, Charles		Mar. 15, '59	Jefferson Med. Col., Phila.
Kinmouth, William R	Farmingdale	Feb. 12, '72	Columbia College, N. Y.
Kimball, Walter S	Eatontown	Mar. 4, '63	College Med. Hom., N. Y.
Kinmouth, William R. S.	Manasquan	Mar. 25, '79	American University, Phila.
Kinmouth, Hugh S	Asbury Park	Mar. 2, '70	Columbia College, N. Y.
Kimball, Revel B	Seabright	Mar. 12, '80	Columbia College, N Y.
Kinmouth, William L		Mar. —, '81	U. S. Med. College, N. Y.
Kennedy, Robert		Mar. 10, '81	Hahneman Medical College.
Keator, Bruce S	Asbury Park	Mar. 3, '81	College Med. Hom., N. Y.
Karsner, Charles W		Mar. 12, '78	Jefferson Col. of Pa., Phila.
Karsner, Charles W		Mar. 10, '75	Hahneman Med. Col., Phila.
La Baw, David	Navesink	Mar. 12, '80	Columbia College, N. Y.
Long, Isaac S	Freehold	Mar. 14, '66	University of Pennsylvania.
Lewis, Smith Haines		Mar. 14, '81	University of Pennsylvania.
Mitchell, Henry	Asbury Park	Oct. 1, '66	M. Col. Bellevue Hosp., N. Y.
Marsden, George F	Red Bank	Mar. 1, '66	Col. Med. Hom., Phila., Pa.
Mackenzie, C		Feb. 21, '60	College of East Hudson, O.
Mackintosh, Sarah F		Oct. 1, '72	Col Med. Fem. Hosp., N. Y.
Marren, Rosemond W		Mar. 1, '78	Col. M. Bellevue Hosp., N. Y.
Morgan, John C		Mar. 5, '52	Medical College of Penna.
Moore, Charles H		Feb. 27, '73	Columbia College. N. Y.
Mosely, Nathaniel R		Mar. 6, '49	Col. of Med., Phila., Pa.
Morton, Francis Knox		Mar. 7, '82	Jefferson Col. of Pa., Phila.
Merriman, Elisha Smith		Mar. 27, '56	University of Michigan.
Neafie, Harry	Turkey	Apr. 1, '80	Col. M. Bellevue Hosp., N. Y.
Norton, Horace Greeley	Imlaystown	Mar. 15, '80	University of Pennsylvania.
Nobles, Milton A		June 9, '81	Col. of Med. and Surg., N. Y.
Ostrom, H. I		Mar. 3, '73	Hom. College Med , N. Y.
Offenbach, Robert		Feb. 17, '79	University City of N. Y.
Odell, Frank M		Mar. —, '75	University City of N. Y.
Palmer, George M		Mar. 4, '80	Eclectic Col Med., N Y.
Pemberton, Harry H	Long Branch	Mar. 9, '72	Jefferson College of Penna.
Parrish, Joseph		Apr. 4, '44	University of Pennsylvania.
Pemberton, John B		Mar. 12, '64	Columbia College, N. Y.
Patterson, William F		Dec. 23, '75	Albany Medical College.
Pomeroy, Mary A. G		Mar. 3, '70	Boston University, Mass.

MONMOUTH COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Pemberton, Charles	Asbury Park	Mar. 9, '82	Jefferson College of Penna.
Pierson, Samuel		Mar. 13, '81	Columbia College, N. Y.
Ridgeway, Thomas E.	Red Bank	Mar. 10, '64	Jefferson College of Penna.
Rogers, Ricardum R.		Mar. 30, '62	University of Pennsylvania.
Rhodes Robert D.	Keyport	Feb. 28, '56	Western Hom. Col., Cleve., O.
Roth, Edward		Mar. 1, '80	Col. Med. Bellevue Hosp.
Rockwell, Philomen G.		July 2, '46	Berkshire School Med., Mass.
Roberts, Daniel E.	Keyport	Mar. 3, '83	University of City of N. Y.
Rhein, Meyer L.		Mar. 5, '80	Albany Medical College
Robinson, George F.		Mar. 12, '81	Jefferson Medical Col., Phila.
Swan, Benjamin I.		Mar. 1, '70	Bellevue Medical Col., N. Y.
Sanders, C. Walton		Mar. 1, '78	Columbia College, N. Y.
Still, Emma R.		May 23, '57	Ecl Col Med, Cincinnati, O.
Shaw, E. D.		Mar. —, '80	University of City of N. Y.
Smith, Andrew H.		Oct 4, '80	Col. Med. Surg. City of N. Y.
Starks, W. H. L.		June 9, '53	Col. Med., Castleton, Vt.
Seward, Benjamin I.		Mar. 1, '70	Col. M. Bellevue Hosp., N. Y.
Stryker, Edward V.		Sept. 12, '72	Col. Medicine, Albany, N. Y.
Street, David Reese		Mar. 15, '80	University of Pennsylvania
Simmons, Charles E.		Mar. 10, '64	Columbia College, N. Y.
Smith, Charles S.		Mar. 12, '79	Jefferson College of Penna.
Sayre, Jeremiah E.		Apr. 2, '83	Jefferson College of Penna.
Sackett, Edgar Wayne		Mar. 14, '82	Hahneman Med. Col., Phila.
Trafford, Alfred F.	Red Bank	Mar. 8, '77	Hahneman Med. Col., Phila.
Trask, Frederick M.		June 1, '75	Bellevue Col. Med., N. Y.
Tusting, Robert	Asbury Park	Jan. 22, '62	Eclec. Col. Med., Phila., Pa.
Tantum, J. R.	Ocean Grove	Mar. 4, '65	Col. Med. Hom., Phila., Pa.
Taylor, Edward F.	Middletown	Apr. 9, '53	University of Pennsylvania
Thropp, Augustus P.		Mar. 4, '62	Col. Med. Hom., N. Y.
Thirrcelin, Etienne H.		June 1, '40	Un. of France, Acad. of Paris
Todd, Alphonso R.		Mar. 13, '80	Jefferson College of Penna.
Vandyke, C. D. W.	Perrinsville		Albany Med. College, N. Y.
Van Mater, I. H.	Atlantic Highl'ds	Mar. 15, '80	University of Pennsylvania
Vanderbeck, Cornelius C.		Mar. 9, '72	Jefferson College of Penna.
Wildes, Thomas		Mar. 2, '76	Col. Med. Hom., N. Y.
Welch, George T.	Keyport	Mar. 13, '68	University of Pennsylvania
Woolley, George W.		Mar. 1, '36	Ohio College of Medicine
Watkins, William B.		Mar. 1, '79	Bellevue Hosp. Col. M., N. Y.
Williams, J. A.		Jan. 27, '64	Rush Medical College, Ill.
Wilber, George F. F.		Mar. 15, '82	University of Pennsylvania
Warner, G. Bray		Mar. 9, '82	University of City of N. Y.
Youlin, I. I.		Mar. 1, '54	Col. Med. Hom., Cleve., O.
Yelvington, Alfred Pearce		Feb. 26, '80	Eclec. Med. Col. City of N. Y.
Yelvington, Charles H.		Feb. 24, '81	Eclec. Med. Col. City of N. Y.

MORRIS COUNTY.

Anderson, Calvin		Mar. 9, '65	Columbia College, N. Y.
Andrews, H. B.	Morristown	Nov. 11, '78	New York City University.
Barker, Phanett C.	Morristown	Mar. 1, '60	University of State of N. Y.
Buttolph, H. A.	Morris Plains	Dec. 2, '35	Williams College, Mass.
Becker, G. A.	Whippany	— —, '80	Columbia College, N. Y.
Byram, John	Mine Hill	Mar. —, '81	Baltimore College
Booth, A. C.		June 27, '77	Harvard University, Mass.

MORRIS COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Cooper, E. P.	Parsippany	Feb. 20, '71	New York University
Case, Levi W.		Mar. 12, '80	Columbia College N. Y.
Carpenter, A. E	Boonton.	May 12, '74	Pennsylvania University.
Condict, Arthur W.	Dover	June —, '82	Michigan University.
Condict, Isaiah W.	Dover	May 11, '47	Med. Soc of New Jersey.
DeHart, John N.	Madison	June 21, '65	New York University.
Derry, W. E.	Dover	—— —, '80	Columbia College, N. Y.
Douglass, James	Morristown	Mar. 13, '80	New York University.
De Groot, George		—— —, '80	Columbia College, N. Y.
Day, Harry V.		July 11, '76	New York University.
Dreher, George W.	Bloomingdale	—— —, '23	Jefferson College of Penna.
Farrow, Levi		Mar. 9, '65	Columbia College, N. Y.
Flagler, Thomas B.		June 13, '54	Albany Med. College, N. Y.
Fonda, Edward S.		Mar. 5, '79	U. S. Med. Col. of N. Y.
Ford, Mary C.	Dover	Mar. 31, '75	Female College, N Y.
Glenn, Irenaeus R.		Mar. 12, '64	University of Pennsylvania.
Hulshizer, Henry	Port Oram	Feb. 28, '56	Philadelphia Col. of Penna.
Hunter, John M.		—— —, '54	New York University.
Hedges, Smith E.	Chester	Mar. 6, '52	New York University.
Hoffman, Joseph	Morristown	Mar. 15, '83	Hom. Med. College of N. Y.
Hann, P. S.	German Valley	Mar. 15, '83	Hom. Med. College of N. Y.
Iliff, Elias P.		June 21, '77	Long Island Col. Hosp.
King, Joseph D	Dover	June 26, '67	Long Island Col. Hosp.
Lindsley, James C.		Mar. 1, '69	Columbia College, N. Y.
Lewis, A. A.		—— —, '68	University of New York.
Lloyd, T. M.		—— —, '76	University of Pennsylvania.
Lumsden, R. C.	Rockaway	—— —, '81	Columbia College, N. Y.
Lawrence, B. M.		Dec. 25, '65	Hygieo Thera. College, N. Y.
Macwithey, A. A.		Nov. 20, '53	University of New York.
Owen, Frederick W.	Morristown	Mar. 5, '57	Georgetown College.
Platt, Joseph H.		—— —, '56	Med. Hom. College Penna.
Pierson, Samuel	Morristown	—— —, '81	Columbia College, N. Y.
Pierson, Stephen		Mar. 1, '69	Columbia College, N. Y.
Ryerson, John G.	Boonton	Mar. 4, '59	New York University.
Romondt, C. D. V.		Feb. 22, '72	Columbia College, N. Y.
Rossi, E.	Dover	May 4, '36	University of France.
Stiger, J. Henry	Mendham	Mar. 4, '57	New York University.
Stiger, John S.	Mendham	Mar. 17, '50	New York University.
Swan, Charles Y.	Morristown	Jan. 22, '56	New York University.
Swain, George M.		—— —, '70	Columbia College, N. Y.
Smith, Edwin E.		June 22, '71	Long Island Col. Hosp.
Webelacker, Armin.	Morristown	Mar. 6, '71	Hom. Med. Col. of N. Y.
Wadsworth, Sarah J.		Apr. 5, '76	N.Y. Free M. Col. for Women.
Wiggins, Henry C.		Jan. 22, '74	Albany College, N. Y.
Wood, J. Walter		Mar. 30, '81	Columbia College, N. Y.
Wigg. Cuthbert	Boonton	Mar. 1, '80	Bellevue Hosp Med. Col.

OCEAN COUNTY.

Ashhurst, Samuel	Beach Haven	—— —, '61	University of Pennsylvania.
Bean, J. M.	New Egypt	Apr. 1, '54	University of Pennsylvania.
Blake, I. A. D.	Manchester	—— —, '61	Med. Univ. of Phila., Pa.
Buckingham, F. S.	Lakewood	Mar. 1, '71	Columbia College, N. Y.
Burnett, J. P.	Island Heights	Mar. 11, '65	University of Pennsylvania.

OCEAN COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Clayton, Wm. G.	Metedeconk	Mar. 15, '82	Bellevue Hosp. Med Col
Cobb, B S.	Waretown	Feb 20, '51	Cen. M. Col, Rochester N Y.
Disbrow, E Clarence, Jr.	Toms River	—— —, '81	Surg and Phys Col, N. Y.
Disbrow, Rem. L.	Toms River	—— —, '62	Columbia College, N. Y.
Gordon, Chas. O.	Lakewood	Oct. 24, '67	Dartmouth College
Hall, Mary H	Manchester	Sept. —, '63	Med. Univ. of Phila., Pa.
Irwin, Samuel B.	Island Heights	—— —, '55	Jefferson College.
Kenyon, Marcum	Forked River	—— —, '83	Columbia College, N Y.
Mattison, J. B.		—— —, '67	Bellevue Hosp Med. Col.
Mixsell, Joseph A.	Manchester		University of Pennsylvania
Reed, H. W.	Manchester	June 20, '73	American University, Phila.
Tunis, Geo. S.	Metedeconk	—— —, '69	Bellevue Hosp Med Col
Warren, A. D	New Egypt	Feb. 22, '47	Botanic Med Col of Ohio
Webb, John W.	Toms River	—— —, '64	Jefferson Med College, Phila.
Youngman, Maurice	Manchester	Mar. 5, '80	N. Y. Hom. Col. of Medicine.

PASSAIC COUNTY.

Amiraur, James C.	Paterson	June 26, '72	Long Island Hosp. College
Archer, Charles H.	West Milford	May 6, '67	Eclectic M Col of Med., N. Y.
Ayres, Morgan W.		Mar. 1, '75	Col. Phys and Surg, N. Y.
Bibby, James S.	Paterson	Mar. 1, '75	Bellevue Hosp Med Col
Barden, L. H.	Paterson	Feb. 15, '72	Eclectic Med Col., N. Y.
Blackwell, Enos T.	Paterson	June 14, '48	Vermont Med College.
		Mar. 13, '69	University of Pennsylvania.
Balleray, George H.	Paterson	Mar. 1, '69	Col. Phys and Surg., N. Y.
Banta, John H.	Paterson	June 1, '79	Bellevue Hosp. Med Col.
Borden, Davis P.	Paterson	Feb 19, '73	Eclectic Med. Col of N Y.
Busse, William	Paterson	Feb. 28, '72	Col. Phys. and Surg., N Y.
Blundell, William	Paterson	Mar 24, '61	Col Phys. and Surg, N Y.
Bradsworth, John H.	Paterson	Mar 3, '81	N Y Homœopathic Med Col
Coursen, Whitfield S.	Oak Ridge	Mar. 1, '48	Col of Phys and Surg, N. Y.
Coursen, Theodore D.	Oak Ridge	Mar. 1, '80	Bellevue Hosp Med. Col
Carr, Ada	Paterson	Mar 28, '82	N. Y. Woman's Med Col.
Collins, James W.	Passaic	Mar. 5, '63	Bellevue Hosp. Med Col
Church, Charles A.		Mar. 6, '71	N. Y. Hom. Med. College
Campbell, George		Mar 9, '82	Univ. of the City of N Y
Day, Harry V.		July 1, '76	Univ. of the City of N Y
Dewey, Raphael P.		June 20, '70	Eclectic Med. College, Phila.
Delatour, Arthur	Paterson	Mar. 8, '82	United States Med. Col
Decker, William F.	Paterson	Mar. 2, '76	N Y. Hom Med. Col
De Yeo, Charles P.		Mar. 15, —	Maryland Academy, Balt
Ferleman, L. M. B.		Nov. 3, '80	Middleburgh M Sch Zealand
Furbeck, Henry L.	Little Falls	Mar. 4, '81	Albany Medical College
Friedrich, Gustav L.	Paterson	Dec. 22, '52	University of Berlin, Prussia.
Garnett, O. V.	Paterson	Mar. 10, '55	Jefferson College, Phila
Gedney, Jacob M. R.	Little Falls	Mar. 1, '69	N. Y. Homœopathic Med Col
Gillson, Michael W.	Paterson	Mar. 1, '81	New York University.
Hengeler, Jacob	Paterson	Mar. 5, '57	N. Y Med College
Harris, Philander A.	Paterson	Mar. 27, '72	University of Michigan.
		Feb. 27, '73	Col of Phys and Surg, N. Y.
Herrick, John C.	Passaic	June 29, '69	Long Island Col Hosp.
Howe, John M.	Passaic	June 19, '44	Castleton Med Col., Vermont.
Hepworth, Frederick J.	Paterson	June 14, '81	Long Island Hosp. Col.

PASSAIC COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Hill, William Dudley......	Paterson.............	July 6, '69	Vt. Univ. and Agric. Col.
Hurd, William S...........	Paterson............	Mar. 10, '77	New York University.
Holman, Henry R	....	Mar. 7, '71	Kans. City Col. Phys. & Surg.
Johnson, Walter B......	Paterson............	Mar. 1, '78	Col. of Phys. and Surg , N. Y.
Kent, William..............	Paterson............	June 26, '73	Long Island Hosp. Col
Kopschina, Theodore.......	Paterson............	Jan. 2, '77	Bd. of Exam., Griefwald, Ger.
Kip, Henry..................	Paterson............	Mar. 1, '77	Col. of Phys. and Surg., N. Y.
Kane, Thomas J...........	Paterson............	June 26, '72	Long Island Hosp. Col.
Kehrer, Augustus B.......	....	Mar. 15, '80	Hahneman Med Col., Phila.
Keeler, Edgar A...........	Little Falls.........	Mar. 3, '80	Maryland Col. Phys. & Surg.
Kinne, Porter S............	Paterson............	Mar. —, '72	N. Y. Hom. Med. Col.
Kinne, Theodore Y.........	Paterson............	Dec. 23, '62	Albany Medical College.
Kinne, E. Alin.............	Paterson............	June 27, '78	Michigan University.
Knowles, Rollin H.........	Paterson............	Feb. 25, '81	Starling Med. Col., Col., O.
King, Joseph H............	Paterson..........	June 10, '71	American Univ. of Phila.
		June 25, '69	Penna. Eclectic Med. Col.
Liggett, Samuel J.........	Passaic.............	Mar. 12, '28	Jefferson College, Phila., Pa.
Lawrence, B. M...........	....	Dec. 25, '65	N. Y. Hygieo Thera. Col.
Lindenhovins, F. H........	Paterson............	July 28, '73	Utrecht.
Leal, John L...............	Paterson............	Oct. 2, '83	Col. of Phys. and Surg., N. Y.
Maines, Robert G..	West Milford.......	Mar. 10, '63	Jefferson Med. Col., Phila.
Myers, Charles F. W.....	Paterson............	Mar. 3, '74	Col. of Phys. and Surg., N. Y.
Moorehouse, Elias W......	Paterson............	Mar. 9, '82	N Y. Univ. Med. Col.
Marsh, Elias J............	Paterson............	Mar. 8, '58	Col. of Phys. and Surg., N. Y.
Mackintosh, James H.....	Paterson............	Mar. 1, '72	Bellevue Hosp. Med. Col.
Mackintosh, Sarah F......	Paterson............	Oct. 1, '72	N. Y. Hp. M Col. for Women.
Merrill, J. Randolph......	Paterson............	Mar. 11, '54	Jefferson College, Phila , Pa.
Montague, Harriet.........	Paterson............	June 4, '74	N. Y. Med. Col. for Women.
Maginnis, Bryan Charles	Paterson............	Mar. 3, '83	Univ. of the City of N. Y.
Neer, Rush..................	Paterson............	June 23, '80	Long Island College Hosp.
Newton, William K........	Paterson............	Mar. 1, '78	Col. of Phys. and Surg., N. Y.
Newcomb, George F.......	Paterson............	Mar. 1, '77	Col. of Phys. and Surg., N. Y.
O'Grady, Thomas F.......	Paterson............	Mar. 1, '80	Bellevue Hosp. Med. Col.
Ossa, Luis F................	....	Feb. 4, '76	Washingtonian M U., Balt.
Paxton, John P............	Paterson............	June 26, '72	Long Island Hosp. Col.
Parke, Henry..............	Paterson............	Mar. 1, '82	Col. of Phys. and Surg , N. Y.
Quin, John.................	Paterson............	May 16, '50	Med. Society of New Jersey.
Rogers, Alexander W......	Paterson............	Mar. 29, '36	Col. of Phys. and Surg., N. Y.
....	....	Apr. 23, '45	Med. Soc. of New Jersey.
Ricardo, Norton C........	Passaic.............	Mar. 1, '69	Hom. Med. College, N. Y.
Rice, Frank H............	Passaic.............	June 21, '54	Vermont State Med. School.
Russell, William H., Jr....	....	Mar. 10, '77	Univ. of the City of N. Y.
Stewart, James M..........	Paterson............	Mar. 13, '80	Jefferson Med. Col., Phila.
Solatinow, Joseph..........	Paterson............	Mar. 1, '82	Eclectic Med. Col., N. Y.
Smith, James William......	Paterson............	Mar. 15, '82	Bellevue Hosp. Med Col.
Silver, George A...........	Bloomingdale	Mar. 8, '81	New York University.
Searls, Wellington B......	....	Feb. 28, '72	Col of Phys. and Surg., N. Y.
Schrebinzuber, Anthony..	....	Mar. 12, '70	University of Graecus, Styria.
Seward, Benjamin S.......	....	Mar. 1, '70	Bellevue Hosp. Med. Col.
Terriberry, George W......	Paterson............	Mar. 1, '66	Bellevue Hosp M. Col , N. Y.
Terriberry, Calvin..........	Paterson............	Oct. 1, '72	Bellevue Hosp. M. Col., N. Y.
Terhune, Richard A........	Passaic.............	Mar. 8, '60	Col. of Phys. and Surg , N. Y.
Terhune, Garret............	Passaic.............	June 21, '34	N. J. State Medical Society.
Townsend, Samuel C......	Paterson	Mar. 1, '79	Bellevue Hosp. Med. Col.
Van Dalsen, Spencer......	Paterson............	Mar. 3, '76	Col. of Phys. and Surg., N. Y.
Van Giesen, Henry C......	Paterson............	Feb. 8, '66	Col. of Phys. and Surg., N. Y.

PASSAIC COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Vreeland, Frank D.	Paterson	Mar 12, '79	N. Y. Hom. Med Col
Van Den Bylardt, J. Ed	Paterson	June 6, '45	Medical Soc. of New Jersey
Van Winkle, Mark	Little Falls	Oct. 12, '55	Col. of Phys. and Surg., N. Y.
Van Riper, Cornelius S.	Paterson	Mar. 8, '66	Col. of Phys. and Surg., N. Y.
Whitley, William H.	Paterson	Mar. 6, '66	Georgetown College
Wright, Joseph B.	Paterson	Mar. 12 '79	New York City University.
Warner, Oswald	Paterson	Oct. 12, '54	Col. of Phys. and Surg., N. Y.
Wolfe, Aaron Robert	Paterson	Mar. 9, '82	Univ. of the City of N. Y.
Was, J. W.		Mar. 27, '78	Michigan University.
Withers H. D.	Paterson	Mar. 15, '53	Maryland Academy.

SALEM COUNTY.

Abbott, Clarence G.		Mar. 10, '79	Hahneman Med. Col., Phila.
Atkinson, Charles P.	Palatine	Feb. 21, '66	University of Med., Phila
Allen, Lefferson A. D.	Woodstown	Mar 14, '67	University of Pennsylvania.
Bilderback, Frank	Salem	Mar. 11, '70	University of Pennsylvania.
Beckett, Albert T.	Salem	Mar. 10, '73	Hahneman Med Col. Phila.
Backus, Boardman P.		Mar. 4, '81	Eclectic Med Col., Phila
Cook, Joseph	Daretown	Apr. 3, '47	University of Pennsylvania.
Cheeseman, P.	Elmer	Mar 10, '79	Hahneman Med. Col., Phila.
Conover, James V.	Elmer	June 1, '80	Eclectic Med. Col., Pa
Ewing, Warren L.	Alloway	Mar. 30, '82	Jefferson Med. Col., Phila.
English, Felix S.	Elmer		Affidavit—20 years' practice.
Foster, Naomi B.	Woodstown	Mar. 9, '65	Pennsylvania Med Univ
Flanigan, Henry M.	Pennsgrove	Apr. 27, '65	Eclectic Med. Col., Penna.
Gibbon, Quinton	Salem	Mar 28, '33	University of Pennsylvania
Gilman, Uriah	Woodstown	Mar 28 '61	Jefferson Med. Col., Phila.
Glover, Lawrence L.	Hancock's Bridge.	Mar. 30, '82	Jefferson Med Col., Phila
Garrison, Daniel	Pennsville	Mar 13, '80	University of Pennsylvania.
Johnson, Mayhew	Pennsgrove	July 3, '50	University of Pennsylvania
Johnson, Henry T.	Pedricktown	Mar. 15, '78	University of Pennsylvania
Jackson, Henry	Salem	Mar. 14, '82	Hahneman Med. Col., Phila.
Moore, David	Pennsgrove	Apr. 29, '65	Eclectic Med. College, Phila
McPherson, Andrew G.	Quinton	Mar 14 '76	University of Pennsylvania
Newton, Charles	Sharpstown	May 26, '62	Hahneman Med. Col., Phila.
Presson, John E	Salem	Apr 7, '49	University of Pennsylvania.
Patterson, Theophilus	Salem	Mar 9, '48	Jefferson Med. Col., Phila.
Patterson, James A.	Salem	Mar. 30, '82	Jefferson Med Col., Phila.
Paulding, Moses J.	Daretown	Mar. 11, '65	University of Pennsylvania.
Reed, Lewis W.	Woodstown	Mar. 12 '77	University of Pennsylvania.
Robinson, Mary Emma	Salem	Mar. 16, '76	Women's Med. Co., Penna.
Summerill, John M.	Pennsgrove	Mar. 13, '75	University of Pennsylvania.
Sharp, Edward S.	Salem	Apr 1, '54	University of Pennsylvania.
Sherron, Clifford M.	Salem	Mar. 14, '79	University of Pennsylvania
Souder Philip G.	Woodstown	Mar. 10, '75	Hahneman Med Col Phila
Stitt, William F	Salem	June 26, '58	Eclectic Med Col., Phila
Thompson, Joseph H.	Salem	Mar. 31, '37	University of Pennsylvania.
Ware, James B.	Pedricktown	Apr. 1, '51	University of Pennsylvania.
Waddington, Benj. A.	Salem	Mar. 11, '65	University of Pennsylvania.
Wiley David	Salem	Mar. 11, '70	University of Pennsylvania.
Woodruff Alpheus B.	Elmer	Mar. 12, '74	University of Pennsylvania.
Wallace, Lemuel	Alloway	Mar. 14, '72	Eclectic Med. Col., Penna.

SOMERSET COUNTY.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Beekman, John B..........	North Branch......	June 23, '81	University of New York.
Berg, J. Fred., Jr..........	North Branch......	Mar. 8, '62	Jefferson College, Phila.
Badger, Merritt O.........	....	June 9, '81	University of New York.
Compton, Isaac L..........	Bound Brook......	Feb. 28, '79	Columbia Med. College, N Y.
Cornell, Jacob B...	Somerville	Mar. 1, '78	Columbia Med College, N. Y.
Countin, G. H. B...........	....	Mar. 12, —	New York Medical College.
Craig, Lewis.................	Plainfield	May 8, '32	Med. Society of New Jersey.
Crater, Henry...............	Somerville	Mar. 11, '72	Hahneman Med. Col., Phila.
Dayton, John	Basking Ridge.....	June 9, '37	Med. Society of New Jersey.
De Hart, Sarah E...........	....	Mar. 23, '70	Medical Academy, New York.
Edwards, John F...........	Raritan	Mar. 8, '48	New York University.
Field, Chauncey M........	Plainfield	Mar. 1, '75	New York Medical College.
Fisher, Claudius R. P.....	Bound Brook......	Mar. 10, '75	Jefferson College, Phila.
Fisher, Farley...............	....	Jan. 1, '68	Hobert College, Geneva, N. Y.
Harper, Henry........	Findern..............	Dec. 14, '62	Eclectic Med. College, Phila.
Hawk, Edward P...........	....	Mar. —, '58	University of Pennsylvania.
Hecht, John P..	Raritan	Mar. 13, '80	Jefferson College, Phila.
Hunt, Azariah P............	Somerville...........	May 9, '48	Med. Society of New Jersey.
Jones, Fred. C...............	....	Mar. 1, '77	Columbia Med. College, N. Y.
Keep, Caroline J. Y.......	....	Mar. 1, '57	N Y. Homœopathic Med. Col.
Matthews, Benj. B.........	Bound Brook......	Mar. 27, '58	University of Pennsylvania
Mattison, Wm. E...........	Plainfield	Mar. 4, '52	Columbia Med College, N. Y.
Maynard, James G.........	....	Mar. 9, '56	University of Pennsylvania.
Merrell, Wm. H...........	South Branch......	Mar. 1, '69	Bellevue Hosp. Med. Col. N.Y.
Mosher, Abram B..........	....	Mar. 12, '79	University of New York.
Mount, David H............	....	Feb. 23, '72	Columbia Med. College, N. Y.
Nelson, Adonis..............	Neshanic	Mar. 10, '79	University of Pennsylvania.
Pennington, Wm............	Basking Ridge.....	Mar. 5, '66	University of New York.
Perry, Edward.............	Peapack	Nov. 23, '47	Med. Society of New Jersey.
Quint, Silas H..	... ...	Mar. 10, '73	Hahneman Med. Col., Phila.
Ribble, Wm. B..............	Millstone	Apr. 24, '52	Med. Society of New Jersey.
Ribble, Jesse S. B..........	....	Mar. 3, '54	Col. of Phys. and Surg. N. Y.
Skillman, Geo. M..........	Bound Brook......	Mar. 10, '81	Hahneman Med Col., Phila.
Swinton, Wm. J............	Somerville...........	Mar. 1, '73	Bellevue Hosp. Med. Col. N Y.
Taylor, S. O. B.............	Millstone.............	Mar. 12, '72	University of Pennsylvania.
Thornton, Byron...........	Peapack	Apr. 1, '54	University of Pennsylvania.
Troutman, Seymour C.....	Somerville	Mar. 3, '54	Univ. of N. Y., C of Ph. & Sur.
Tompkins, Lucius D.......	Harlingen	Mar. 12, '77	University of Pennsylvania.
Van Derveer, Henry F...	Somerville.	Jan. 27, '52	Med. Society of New Jersey.
Van Derveer, James D....	North Branch......	Mar. 8, '66	Columbia Med. College, N. Y.
Van Deventer, Jno. L.....	....	Mar. 13, '81	Columbia Med. College, N. Y.
Van Nest, Geo. V...........	Weston	Apr. 2, '83	Jefferson College of Phila.
Wagoner, Henry G........	Somerville	Apr. 28, '52	Med. Society of New Jersey.
Wilson, Abram S...........	....	Mar. 12, '81	Jefferson College of Phila.
Zeglie, Peter J..............	Warrenville.........	May 16, '82	Columbia Med. College, N. Y.

SUSSEX COUNTY.

Strader, John C.............	Lafayette	Dec. 26, '71	Albany Medical Col., N. Y.
Potter, Emerson B.........	Ogdensburg.........	Feb. 28, '79	Col. of Phys. and Surg., N. Y.
Cochran, Clarance F.......	Stanhope.............	Mar. 26, '73	University of Michigan.
Fithian, Henry C..........	Late of Andover...	Mar. 12, '77	University of Penna , Phila.
Allen, Carlos.................	Newton	May 9, '48	Medical Soc. of New Jersey.
Miller, Levi D..............	Newton	Mar. 8, '55	Univ. of the State of N. Y.
Ferguson, Benjamin W...	Beemerville	Mar. 1, '78	Bellevue Hospital.
Cannon, Frederick M.....	Deckertown	Mar. 1, '67	University of New York.

SUSSEX COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY
Davison, Calvin R	Stanhope	Mar. 31, '69	University of Michigan.
Potts, Edgar	Coleville	Mar 15, '76	Univ. of the City of N. Y.
Morrison Ephraim	Newton	Mar. 1, '75	Bellevue Hospital
Couse, Joseph P	Hamburgh	Mar. 30, '70	University of Michigan.
Morrison, Joseph	Late of Deckert'n	Mar. 1, '78	Bellevue Hospital.
Jacobus, Peter	Newton	Jan. 20, '58	Eclectic Med Col, Phila.
Nelden, Charles B	Stanhope	Mar 3, '64	Bellevue Hosp., N. Y City.
Cooper, D. W	Unionville.	Mar. 9, '55	Univ. of the City of N. Y
Lewis William Henry	Newton	Mar. 1, '65	Bellevue Hospital.
VanGaasbeck, Harvey D.	Deckertown	Mar. 11, '78	Univ. of the City of N. Y.
Douglas, William H	Ogdensburg	Mar. 1, '79	University of Pennsylvania.
Williamson, Alexander		Mar 14, '78	University of Penna., Phila
Rohe, Frederick G	Late of Newton	Mar. 15, '83	New York College.
Jacobus, Peter N	Newton	June 13, '83	Medical Soc of New Jersey.
Drake, Charles F	Newton	Mar. 9, '82	Univ. of the City of N. Y.
Condict, Arthur W	Andover	June 29, '82	University of Michigan
Beers, Francis	Flatbrookville	Mar. 12, '81	Jefferson College of Phila.

UNION COUNTY.

Burlingham, Harvey D.	Plainfield	— —, '57	N. Y. Col. Phys. and Surg.
Brown, Louis R	Elizabeth	— —, '64	Pa. Hom. Med. Col., Phila.
Bailey, George W	Elizabeth	— —, '62	Pa Hom. Med Col, Phila.
Bradner, Wesley K		— —, '75	Bellevue Hosp M. Col, N. Y.
Bowen, Robert J	Elizabeth	Feb. 19, '53	American Med Col., Cin., O.
Boone, William C	Plainfield	Mar. 4, '72	Maryland Academy, Balt.
Burhans, W. M			Univ. of Med and Sur, Phila.
Bates, Cornelius S		Jan. 3, '81	Eclectic M Col of Pa, Phila.
Browne, Clifford J	Linden	— —, '63	University of New York.
Braun, Rudolph	Elizabeth	— —, '83	N. Y. Col Phys and Surg.
Coutin, Gustavus H. B.			New York Medical College.
Crane, Job S	Elizabeth	Mar. —, '49	N Y. Col Phys. and Surg.
Cowan, Isaac F	Cranford		University of Pennsylvania.
Coles, Jonathan A		Feb. 28, '68	Col. of Phys. and Surg, N Y.
Cladek, Walter B	Rahway	— —, '77	University of New York.
Crouthers, Anna J		Mar. 28, '82	N. Y. Med Col for Women.
Dart, James M	Cranford	— —, '75	N Y Hom. Med Col.
Daly, John J	Rahway	— —, '73	Univ. of the City of N. Y.
Drake Lewis			University of Pennsylvania.
Del Risco, J., Jr		— —, '79	N Y Col Phys. and Surg.
Endicott, George W	Plainfield	— —, '75	Jefferson College, Phila, Pa.
Easton, Thomas S	New York City	Apr. 1, '54	University of Pennsylvania.
Friedrich, Gustavus L		Dec. 22, '52	Royal U. Fred William, Prus.
Fritts, John Thomas	Plainfield	Mar. 1, '66	Bellevue Hosp. Med Col.
Field, Chauncey M	Bound Brook	— —, '75	N Y. Col. Phys and Surg.
Fortune, David J	Elizabeth	— —, '83	Univ. of the City of N Y
Gray, Mrs. E. M		Feb. 8, '77	Cin. Lit. and Scien. Inst. and Physio-Med. Col.
Green, James S	Elizabeth	Apr. 5, '51	University of Pennsylvania.
Grier, Joseph H	Elizabeth	— —, '61	University of Pennsylvania.
Grier, Philip H	Elizabeth	— —, '53	University of Pennsylvania
Grant, Frank S	Plainfield	— —, '75	N Y Col Phys and Surg
Glen, Irenaeus R		— —, '64	University of Pennsylvania.
Harrison, Joseph B	Westfield	Mar. 1, '76	N. Y. Col. of Phys. and Surg.

UNION COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Hart, Charles A	Plainfield	— —, '65	New York Medical College.
Holmes, Charles B	Rahway	— —, '74	N. Y. Hom. Med. College.
Hough, H. Page	Rahway		Jefferson College Penna.
Hough, DeWitt Clinton	Rahway	— —, '40	Jefferson College Penna.
Hough, Thomas L	Elizabeth	— —, '56	Jefferson College Penna.
Johnson, Phebe R		— —, '80	N. Y. Eclectic Med. Col.
James, Hiram H	Rahway	— —, '63	University of Penna., Phila.
Jobs, Nicholas C	Springfield	Mar. 3, '74	Columbia College, N. Y.
Johnson, William M			University of Michigan.
Keeney, Sarah Danforth	Plainfield	Apr. 1, '74	N. Y. Free Med. C. for Wom.
Kirk, Richmond M		— —, '65	Jefferson College Penna.
Kinch, Frederick A	Westfield	May 13, '51	Med. Soc. of New Jersey.
Kinch, Frederick A., Jr.	Westfield	— —, '82	N. Y. Col. of Phys. and Surg.
King, Joseph H		Jan. 25, '67	Eclec. College Penna., Phila.
King, Joseph H		June 10, '71	American Univ., Phila., Pa.
Lowrie, Henry H	Plainfield	— —, '63	Georgetown College.
Lawrence, William H	Summit	— —, '77	University City New Orleans.
Long, Monroe B	Plainfield	Mar. 1, '75	N. Y. College Phys. and Surg.
Larew, Charles		— —, '75	Eclectic Med. College, N. Y.
Lukens, Israel	Rahway	Apr. 27, '54	Eclectic Med. College Penna.
Lawrence, B. M		Dec. 25, '65	N. Y. Hygieo Thera. College.
Morton, Joseph B	Elizabeth	— —, '49	N. Y. College Phys. and Surg.
Mack, William A. M	Elizabethport	Mar. —, '78	Bellevue Hosp. Med. College.
McLean, Thomas N	Elizabeth	— —, '71	Yale College, New Haven.
Mravlag, Victor	Elizabeth	June 21, '72	University of Vienna, Aust'a.
Martin, Robert G	Elizabeth	— —, '65	Hom. Med. College, Penna.
Mravlag, Lucy A. G	Elizabeth	Apr. 9, '77	N. Y. Med. College for Wom.
McConnell, Joseph K		Feb. 25, '68	Starling M. C., Columbus, O.
Miller, William H			Univ. Vict Col., Coburg, Can.
McKnight, Charles S		— —, '77	N. Y. Col. of Phys. and Surg.
Moorehouse, Elias W	New Providence		University City of New York.
Morris, James A		— —, '67	Eclectic Med. College, N. Y.
Muller, Dorothea		Apr. 16, '75	Medical Col., Stuttgart, Ger.
Oakley, Lewis W	Elizabeth	Mar. —, '52	Col. of Phys. and Surg., N. Y.
Oliver, Frederick W	Rahway	— —, '78	Jefferson College Penna.
O'Reilly, Edward R		Mar. 7, '82	Univ. of the City of N. Y.
Pettit, Alonzo	Elizabeth	Feb. —, '67	University of Buffalo, N. Y.
Pickett, John H		— —, '60	University of Buffalo, N. Y.
Pinneo, Joseph Otis	Elizabeth	— —, '65	Col. of Phys. and Surg , N. Y.
Probasco, John B	Plainfield	Mar. 13, '69	Univ. of Pa. Med. Dept.
Pardee, Howard A		— —, '80	Univ. of the City of N. Y.
Page, Rebecca P		— —, '69	N. Y. Med. Col. for Women.
Pierson, Henry C		— —, '68	M. Dept. of Georgetown Col.
Platt, Joseph H		— —, '56	Hom. Med. Col. Penna.
Risk, William H	Summit	Mar. —, '66	University of Penna., Phila.
Rushmore, Edward		— —, '72	Jefferson College, Penna.
Reed, Rufus		— —, '70	Hahneman Med. Col., Phila.
South, Ephraim W	Plainfield	Feb. 27, '69	Hom. Med. Col., Phila., Pa.
Schleimer, David	Elizabethport	— —, '73	Georgetown College.
Stillman, Charles F	New York City	Mar. 1, '67	Col. of Phys. and Surg., N. Y.
Smith, Theodore V		— —, '73	New York Hom. Col.
Shotwell, John H	Rahway	Mar. 8, '77	Hom. Col. of Med., N. Y.
Selover, W. U	Rahway	— —, '64	Univ. of the City of N. Y.
Silvers, Elihu B	Rahway	— —, '52	N. Y. Col. Phys. and Surg.
Sprague, Charles G	Elizabeth	— —, '75	New York Hom. Col.
Strong, George W			(College name not legible).

UNION COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY
Terrill, Thomas, Jr.	Elizabeth	Mar. —, '67	N. Y. Col Phys and Surg.
Tomlinson, Thomas H	Plainfield		University of Penna., Phila
Taylor, John L		—— —, '80	Bellevue Hosp M. Col , N Y.
Thoenges, Maria		Mar. 10, '47	(College name not legible).
Talmage, Thomas G		—— —, '80	Univ. of the City of N Y
Turner, William F	Elizabeth	—— —, '79	University of Pennsylvania.
Titsworth, Randolph		—— —, '53	Hom. Med. Col., Phila , Pa
Utter, Albert	Plainfield	—— —, '47	Univ. of the State of N. Y.
Wescott, Robert	Elizabeth	Apr. —, '53	University of Penna., Phila.
Westcott, Francis W.		—— —, '80	Jefferson Med Col., Phila.
Winans, J. Edward		Mar. 4, '75	N Y. Hom. Col of Med.
Westlake, W. C	Rahway	—— —, '72	N Y. Hom. Col of Med
Younglove, John, Jr	Elizabeth	Mar. 1, '61	Missouri H M. Col., St. Louis.

WARREN COUNTY.

Brakeley, P. F	Belvidere	—— —, '42	University of Pennsylvania.
Bieber, E. H	Phillipsburg	—— —, '48	University of Pennsylvania.
Bieber, L. D	Phillipsburg		University of Pennsylvania.
Baird, William M	Washington	—— —, '77	Bellevue Medical College.
Barber, Isaac	Phillipsburg	—— —, '79	University of Pennsylvania.
Bartholomew, Cornelius	Stewartsville	—— —, '78	Jefferson College Penna.
Clark, Sam'l G	Belvidere	—— —, '48	University of New York.
Cline, Charles H	Polkville	—— —, '80	Jefferson College Penna
Cline, Garner H	Harmony	—— —, '51	Med. Soc of New Jersey.
Cooke, Jno. S	Hackettstown	—— —, '50	University of Pennsylvania.
Creveling, Philip G	Broadway	—— —, '58	College of Pennsylvania
Crane, Theodore	Hackettstown	—— —, '55	Col. of Med. and Surg., N Y.
Cooke, Joseph S	Washington	—— —, '56	University of Pennsylvania.
Case, Nathan	Reigelsville	—— —, '69	University of New York
Cox, Henry M	Port Murray	—— —, '68	University of Michigan.
Crispin, Sam'l D		—— —, '81	Jefferson College Penna.
Cole, William	Port Colden	—— —, '29	Med. Soc. of New Jersey.
Cook, Frank M		—— —, '83	Med. and Surg Col. Md.
Curtis, Joseph W		—— —, '83	University of Maryland.
Dalrymple, Jos. W	Bloomsbury	—— —, '77	Columbia College, N. Y
Dearborne, Geo. S	Oxford Furnace	—— —, '57	Med. College, Albany, N Y.
Detweller, Henry	Easton, Pa	—— —, '36	Friberg College.
Detweller, Jno. J	Easton, Pa	—— —, '54	University of Pennsylvania
Dowd, Edward J		—— —, '80	Medical College of Baltimore.
Funk, Henry S	Port Murray	—— —, '78	Jefferson College of Penna
Gibbs, Aaron L	Hope	—— —, '79	University of Philadelphia
Griffith, John H	Phillipsburg	—— —, '70	Jefferson College of Penna.
Gale, Alfred	Asbury	—— —, '33	Middlebury, Vermont.
Gibbs, Aaron Luce	Hope	—— —, '81	Eclectic Med. Col. of N. Y.
Green, William F	Hainesburg	—— —, '78	Columbia Med Col , N Y.
Herrich, Wm A	Washington	—— —, '59	Albany Medical College
Hartpence, Wm. M	Oxford Furnace	—— —, '65	Bowdoin College, Maryland.
Hoffman, Ludwic A		—— —, '80	Hahneman Med Col., Phila
Hulshizer, Philip T	Stewartsville	—— —, '51	Medical College of Penna
Hoagland, L. B	Oxford Furnace	—— —, '80	University of Pennsylvania.
Jones, George H	Phillipsburg	—— —, '70	University of New York.
Johnson, John C	Blairstown	—— —, '50	Col. of Phys. and Surg., N Y.
Johnston, Frank	Washington	—— —, '83	Col. of Phys. and Surg., Md.

WARREN COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
King, Joseph Henry		——, '67	Eclectic Med. College, Penna.
King, Joseph Henry		——, '71	University of Philadelphia.
Lee, A. H.	Phillipsburg	——, '65	University of Pennsylvania.
Logan, John	Easton, Pa.	——, '77	Eclectic Med. Col. of N. Y.
McGee, Wm. H.	Belvidere	——, '72	Bellevue Med. Col., N. Y.
McCosh, Samuel A.	Stewartsville	——, '74	Jefferson Med. College, Pa.
Martin, Aldén E.	Hackettstown	——, '76	Hahneman Med. Col., Phila.
McKinstry, Frank P.	Washington	——, '78	Hahneman Med. Col., Phila.
Mortimore, Samuel E.			Eclectic Med. Col. of N. Y.
Osmun, L. M.	Phillipsburg	——, '60	Columbia College, D. C.
Osmun, L. C.	Delaware Station	——, '60	Columbia College, D. C.
Paul, J. Marshall, Jr.	Belvidere	——, '68	University of Pennsylvania.
Power, Edward	Oxford Furnace	——, '72	Eclec. Med. Col. of Penna.
Pursel, Peter H.	Phillipsburg	——, '64	University of Pennsylvania.
Roe, Jacob I.	Vienna	——, '75	Col. of Phys. and Surg., N. Y.
Roe, Wm. I.	Vienna	——, '46	Medical Soc. of New Jersey.
Rohrback, Frederich	Johnsonburg	——, '67	Bellevue Med. Col., N. Y.
Roseberry, Chas. J.			University of Pennsylvania.
Reese, James Mitchell	Phillipsburg	——, '83	Bellevue Med. Col., N. Y.
Stewart, Robert A.	Hope	——, '78	University of New York.
Shepperd, F. P.	Phillipsburg	——, '66	University of New York.
Stites, William	Washington	——, '68	University of Pennsylvania
Swartsweller, Peter E.	Polkville	——, '72	University of Pennsylvania.
Sowerby, Joseph John	Washington	——, '61	University of Pennsylvania.
Young, G. Cursen	Roxburg	——, '76	Eclectic Med. Soc., N. Y.

If any omission is discovered in these lists as sent to us by County Clerks, or any corrections are desired, they should be sent to the Clerks of the respective counties and will be noted in the next report. County Societies should now keep a list of all practitioners, and each year the County Clerks should note changes that they may be certified to this Board. It is to the interest of public health that search should be made as to the validity of all doubtful diplomas, and that all good citizens should see to it that none use the title of "Doctor of Medicine" who are prohibited by law therefrom.

REPORT

OF THE

BUREAU OF VITAL STATISTICS

OF THE

STATE OF NEW JERSEY

FOR THE

Statistical Year from July 1st, 1882, to July 1st, 1883,

WITH ADDITIONAL QUINQUENNIAL TABLES.

DEPARTMENT OF STATE.

TO HON. HENRY C. KELSEY, SECRETARY OF STATE.

By EZRA M. HUNT, M.D., Sc.D.,

Medical Superintendent of Vital Statistics.

INTRODUCTION TO THE REPORT ON VITAL STATISTICS.

The statistics of a nation form the ledger by which it keeps account with itself as to all matters that relate to its solvency, its capital, its progress, its material resources and the condition of its constituency. "No inquiry can assume a scientific form unless it has a numerical basis to work upon." It is equally true that in order to study the social basis of a people in its most practical, social, educational and industrial interests, we must inform ourselves as to those conditions which the facts of figures can alone reveal. An English authority, recently speaking on this subject, says: "The question was taken up more and more enthusiastically by enlightened men, until at last the Government Statistical Department was formed, and that remarkable series of reports begun, which will immortalize the name of William Farr. * * * Those reports disclosed a state of things little dreamt of, and the statistical returns, compiled by Dr. Farr, showed how much the life and the health of the nation were dependent upon the conditions in which its individual members were placed."

Statistics which record the "movement of population" even excel in importance those as to (*a*) territory, (*b*) political, (*c*) agricultural, (*d*) industrial, (*e*) commercial and the intellectual, moral and religious condition. Quintelet has well expressed it when he says: "Population is the statistical element *par excellence*; it necessarily rules all the others since it relates above all to the people and the appreciation of their welfare and their wants. * * * The other data have no real value, except so far as they relate to the number of the population. * * * The classification, according to age, allows of the establishment of tables of population, of forming correct ideas on mortality, on the forces at the disposal of the State in case of necessity and of fixing the ratio between the useful fraction which contributes to the general well-being and the fraction which yet requires assistance and support to become in its time useful. The classification by

professions indicates the means by which the population provides for its subsistence and tends to augment its prosperity; it allows the legislator more particularly to fix his attention on the principal wheels which work in the machine confided to his care. The classification by civil condition, by origin, by education, furnishes the administration with no less precious information to assure internal good order and to facilitate the execution of the laws. All questions which are connected with population deserve in general the greatest attention on the part of the government." This has come to be more and more recognized with each succeeding year. The school system which takes cognizance of all those between the ages of five and eighteen, looks after education not as a charity, but because this care of the population is in the interests of the State. Even to make such a census more valuable we need to know how many are born and what proportion of these reach the age of five years, as well as what causes have been operative in reducing the vigor of those now about to enter on school life. If only the feeble died, there might be an incidental advantage in the preservation of a hardier stock. But unfortunately it is found that the infantile deaths are a measure of the enfeeblement of the surviving young population, so that a low sustained death-rate is the best guaranty for the survival of the fittest and the best assurance that those who do survive will be of such strength as to secure abundance for support. In such a land as this there is far more danger of limiting the means of subsistence by lack of vigor in the population than by lack of vigor in the soil or in the demands of productive industries.

The number of marriages is a very fair index of the general vigor and prosperity of the population. It is found that in hard times, or in times of national profligacy, there is always diminution in the number of marriages. The interests of a State are largely concerned in this social relation, as we shall notice more fully in another connection. Not less does the number of deaths indicate the vigor and prosperity of a country or the opposite. For, besides the actual losses of lives more or less valuable, these tell of a tax upon the comfort of families and of community, and upon their ability to secure a livelihood. It often happens that sickness and death paralyze the industries of a people, and are the severest burden of taxation imposed upon them. Where such a tax is avoidable, as is much of prevalent sickness, the State cannot be better employed than in preventing it. Every prudent attempt in this direction is an application of the principles of political

economy. It is a lack of foresight not to make liberal provision to prevent disease, rather than to cause the liberality to depend upon some violent outbreak. What a great pestilence is to cities and States in its paralyzing and discouraging influence, that is sickness and death to each individual family. The marriage, birth and death-rates are found to bear such a proportion to each other and to be such an index of real prosperity or its opposite, that the historical progress or decline of a nation may be traced thereby. The birth-rate does not become excessive where it is only the result of such a marriage-rate as results from announced, legitimate and open marriages. The marriage-rate tends to a right proportion wherever the family and its preservation, care and prosperity are regarded as the defense of the State. The English reports show how "the marriage-rate reflects with much accuracy the condition of public welfare." Its fluctuations coincide in direction though not in degree with those which indicate the success or depression of agricultural, manufacturing or commercial industries. The death-rate has its definite bounds wherever the care of families is such as enforces a proper oversight of the conditions of life and reduces to the minimum the avoidable causes of disease. It is because such statistics afford the data by which we can study the causes that affect these vital conditions of population, that the significance of vital statistics has in the last half century been greatly augmented. Before this, the value of such records was known as bearing on rights of property; on determining questions of age, as of minority or military service, or pensions, and later in the great interests of life insurance. But it has become evident that such records are essential to those studies of life, of disease and of death, on which hinge the dearest interests of the citizens and of the State.

Spencer Wells well expresses it, when, in his recent Hunterian oration before the Royal College of Surgeons, he says: "The knowledge gained by the statistical work of Dr. Farr, and since carried on by Dr. Ogle, at the General Register Office, has led to sanitary legislation, and sanitary work has been followed by a lower general death-rate and smaller mortality in single forms of disease, and especially in those places—the great towns—where sanitation has been most active."

The value and importance of this study has never been more manifested than in the forty-fourth annual report (1881) of the Registrar-General of births, deaths and marriages in England, as just published (1883). The death-register in 1881 numbered 491,935. The death-

rate was 18.9 per 1,000 living; the death-rate in the urban population, consisting of some fifteen and a half million persons, being 20.3, while that of the rural population, comprising some ten and a half million persons, was 16.8. This not only shows a gradual reduction of death-rate, but also how the greater attention paid to health-matters in cities, and the great powers given by the English laws, aid to bring cities to an approximation to the health of rural districts. In some of our own cities the death-rate is nearly double that of the healthiest country districts. Thus the total death-rate of Hunterdon county last year was 14.77 per 1,000, while that of the cities of over 5,000 inhabitants in Hudson county was 29.994 per 1,000.

The remarks of the Registrar-General are so illustrative, and bear so much on the relations of sanitary practice and of statistics to health, that they are here quoted: "There is nothing in the series of annual reports issued by this office that comes out more distinctly and unmistakably than the wonderful effect which the sanitary operations of the last decade have had in saving life. The public health act came into operation in 1872. The average annual death-rate for the immediately preceding ten years (1862–71) had been 22.6, and there were no indications whatsoever of any tendency of the rate to fall lower. Indeed, in 1871, the final year of this period, the rate was exactly the average, viz., 22.6. The act came into force; and at once the rate began to fall, and continued to fall year by year with almost unbroken regularity, until in 1881 it was, as above stated, no more than 18.9. Once only in the ten years that had elapsed since the act came into operation was the rate as high as the average of the previous decade. That was in 1875, when the rate was 22.7. In that year a second public health act, of more stringent character, came into operation; and from that date down to 1881 the death-rate did not once reach 22.0, and averaged no more than 20.5.

"Had the fall in the death-rate been limited to a single year, or to two years, or even to three, it might have been argued by sceptical persons that the improvement was due to a succession of seasons favorable to health, or to other causes unconnected with sanitary administration, and that the setting-in of the fall coincidently with the coming-into-operation of public health measures was no more than casual; but in face of a fall, lasting for ten years in succession and increasing each year in amount, no one can seriously maintain such a position. There can be no real doubt that the saving effected in life was the direct product of the money and labor expended in

sanitary improvements. Doubtless the money thus expended was enormous in amount; and it will be well therefore to consider what return it has brought in."

"Now we shall probably be well within the mark if we assume that for every fatal case of illness there are from four to five more cases which end in recovery. This is about the proportion in enteric fever, which is a more fatal disease than the average of diseases. The result, therefore, on this assumption would be that, speaking in round numbers, there were 500,000 fewer cases of illness, and 92,000 fewer deaths in England and Wales in 1881 than would have been the case had the population been living under the conditions that existed in 1862–71. It may perhaps be objected, and not unreasonably, that the year 1881, with its extraordinarily low death-rate, was so exceptional that it can hardly be taken as a fair sample by which to measure the annual return in life and health from the moneys spent in sanitary improvements. Let us then take the entire period of ten years that elapsed between the first public health act and the close of 1881. Had the death-rate remained during that period at its mean level in the preceding decade, the total deaths from 1872 to 1881, inclusively, would have been 5,548,116, whereas they were actually no more than 5,155,367. Thus no less than 392,749 persons who, under the old regime, would have died, were, as a matter of fact, still living at the close of 1881.* Add to these saved lives the avoidance of at least four times as many attacks of non-fatal illness, and we have the total profits as yet received from our sanitary expenditure. Moreover, it is important to note that these profits were not equally spread over the ten years, but that there was a manifest tendency to progressive increase throughout the period. This is what might be anticipated, for the full effect of sanitary improvements requires time for development."

So far as this State is concerned, it was among the earliest to make an attempt to secure such statistics. However faulty the methods, there was still some advantage in the attempt. The Legislature, in 1878, adopted the present method of collection and record. It has been so far successful, as that the returns furnished will in accuracy and extent compare favorably with any in this country. There is an effort to fulfill the law on the part of those concerned, with the rarest exceptions. The faithfulness of assessors and city clerks is greatly to be commended. The returns of births are below the standard in cities, and it may yet become necessary to make the law as to these

* The mean birth-rates in the two decades, 1862–71 and 1872–81, were almost exactly the same, so that no correction need be made in this case.

more stringent. Such cities as Paterson and Orange show how fully and accurately returns can be secured. As it is possible from the cities and townships in which the returns are more accurate, and from the death-rate under one year of age, to allow for the deficits, so far as comparisons are concerned and deductions are made, the omission is not as disturbing as would at first sight appear. For if we have a sufficient number of actual returns from which to make large generalizations, the omitted events, which belong to exactly the same species of record, in their differences so balance and modify each other that by mathematical formulas "they may be considered as being numerically in the same ratio as the observed (or recorded) events to which they refer."

In the conduct of the Bureau of Vital Statistics it has been the effort of the Board of Health and the medical superintendent to secure those facts, and only those facts, which the ablest authorities on the subject, both in this and other countries, have regarded as essential for record and preservation. The next effort has been to file them in such manner and to record them in such order as shall make them most readily available either for purposes of legal, or social, or medical or sanitary reference. We were so fortunate as to adopt a system and to place the clerical work in such competent hands as has well accomplished this purpose. The result of the medical oversight of the system is to give an order of return, such as shall render the events recorded comparable, and to see to it that the returns are so arranged as shall enable us more especially to determine the causes of diseases and death. It can also be said that to physicians these returns have an educational and clinical value, as they lead to a closer study of the nomenclature of disease, and so to its diagnosis. This always leads to better treatment and to closer watchfulness over all the events of sickness. This has led also to a great extension of inquiry into the preventable causes of disease, and has been one of the influences in aiding those who have special relations to disease. For it is to be acknowledged that until recently most physicians had not come to estimate either the value or importance of that part of education and observation which should accurately acquaint them with the physical surroundings affecting their patients, and with the bearing which these had upon invalidity or death.

As to how far the statistics thus secured should be tabulated and deductions made therefrom and printed as statistical tables, there are some limitations. Some of the facts are only valuable to reason from

after there has been a very large accumulation in numbers. Others, while aiding much the students of sanitation or the Board in testing its work, do not need the printed page, while others which are felt to be desirable are limited by financial considerations. Work with figures, when the figures are to be interpreted as relating to life, is always expensive, and while wise must not too far outrun the appreciation of the legislator or the physician. Most even of the medical profession have never studied numerical methods in this regard. Although John Hunter had inculcated its methods of precision, it was not until the time of Louis, 1832–60, that the use of the numerical method became authenticated. "This last," says Bowditch, "though not infallible, apparently presented a means for as near an approach to the truth as men could hope to secure in medicine. It is now adopted by some of the best minds as the basis of public hygiene."

While the continuous observation of close observers is always valuable, the value is greatly enhanced if facts have been recorded at the time. Indeed, in a vocation which admits of numerical and clinical statements of occurrences, very few who are competent to make reliable observations will be content to do without this aid to their opinions. Quintelet says: "There are many results that can be derived from a record of vital statistics which it is not always obligatory to attempt to derive. For instance, the fact has been ascertained, after very extended comparisons, that the ratio of male births is such that about 106 male children are born to 100 females; that the number of births is greater in the spring than in the summer months." Although such facts are worth knowing and may have a bearing on questions of national vigor, it is not worth while that the statistics be frequently studied to determine facts of this character. On the other hand, it is important to know how many of those born fail to reach majority, or to live to middle life or other designated age, and why they thus fail. For it is thus that we come to a knowledge of the influences which are prevalent to the shortening of human life. Even where we cannot at once intercept the causes, a knowledge thereof is the first hopeful attainment in that direction. The effort, therefore, of this department has been, first of all, to put on record such facts as to the vital movements of population as are deemed important to be accessible for calculations and determinations which social science and political economy have declared to be desirable, and, next, to select from these for study such facts as have the most direct bearing on the welfare of the people. While our records admit of the whole range

of study which is claimed to be of value, other circumstances indicate the selection to be made.

As to marriages, it is desirable to know what has been the number of them for the last five years, what the nationality of those who have been married, and what the occupations of the husbands, and how far residence in city or country seems to modify the marriage-rate.

Some of the facts as to these will be found fully expressed in the tables.

As to births, the name, place and date of births, are matters of identification, and need only the record, and do not need full tables to be printed therefrom. But the parentage of the children, and the number of children as betokening the average size of families, and the number who have previously died, give some important indication as well as the average birth-rate as compared with the death-rate.

Here again the tables give sufficiently, in detail, the results which five years show.

Still-births not only are something of a measure of the vigor of population, but point us often to certain social conditions that have to do with the limitations of life. While the act of causing abortion comes under the criminal code and not under the law, it is found that a watchfulness over premature and still-births is not less in the interests of private and public morality than an important record of the vital or devitalizing causes of such brief life. We find all authorized practitioners disposed to protect families, themselves and the public from the concealment of such births, while the law does much to deter from that criminality in which the failure to make returns is often the strongest evidence of improper interference. It has been asserted by leading medical practitioners in the State that the requirement of a birth certificate has diminished criminal secrecy, and deters those unfitted for complicated cases from venturing so far to imperil the life of mother and child. The loss of mothers and enforced orphanage always means peril to the State in the direction of thriftlessness, pauperism and crime.

Still more significance is attached to the usual death certificates and the classification of their contents. We therefore have heretofore traced the prevalence of some diseases, as consumption, diarrhœa, etc., besides giving each year details as to all the chief diseases which destroy life. From year to year the facts as to these have been prominently kept before the people as well as before the medical profession, and those Local Boards which have special relations to the care of

disease and of the public health. The attention of physicians is especially called to the importance of acquainting themselves with the classification or nomenclature of disease, as contained in the sixth report, pages 285–90.

The study of the tables, as condensed for the last five years, gives many important facts, illustrating how different localities vary in their death-rates, and shows how important is the study of the causes which affect the vitality of population.

DIVORCES IN THE STATE AND THEIR RELATION TO SOCIAL CONDITIONS.

It is not by mere formal custom or by accident that nations and States have always concerned themselves with some regulative laws as to the marriage relation. This has not been in order to patronize the moralities which center around marriage, but directly to insure to the State a reliable constituency for citizenship. The family, and not the individual, is the governmental unit. A sustained nation in which there would be multitudes of people but no marriage, is an impossibility. Laws have not only in the interests of property, but in the interests of natural existence, undertaken to surround marriage with certain safeguards, and to determine the degrees of relationship in which it may occur. When, as by a large class of citizens, it is not surrounded with the restraints and direction of a sacrament, it has been found necessary to make other special provisions for its solemnization and authentication. All the laws that have obtained in Great Britain, as in some other countries, as to previous notification of marriage, have been based upon the idea that clandestine marriages, or too early marriages, or hasty marriages are not in the interests of society and do not accord with the indispensable ethics of government. Our own laws, which inflict certain penalties upon those who perform marriage for those under age, without the consent of parents, or require their own asseveration of having reached a majority, are but the expression of that unwritten code which realizes that all that relates to matrimonial relationship is an integral and essential consideration in natural prosperity and perpetuity. The requirement of a certificate of marriage and of a permanent registry of the event, if it had no necessity as a legal record or as an aid to the study of population, would still be essential as a token of the State's concern for itself and for those thus about to constitute a family. Some States have carried the idea

so far as to require a tax or forfeit from those who cling to single life, because as a class they are less value to the State.

By tracing the ages at which marriage is consummated, the average lives of those marrying, the number of offspring born or raised, and all matters relating to the permanency of the relation, statisticians have been able to estimate the progressive or retrogressive forces of society and thus to warn us to provide against destructive forces. In connection therewith, divorce and the facts as to it become a necessary subject of inquiry. Consequently for a few years past statisticians and political economists have made investigations as to it in our own country, and have discussed with anxiety the portent of certain prevalent tendencies. This has led an able writer to say that "of the present state of social morality in our own country it must be said that the permanence of the family is seriously threatened. With many defects of the times, such a tendency did not show itself with marked prominence until about the middle of this century in the greater multiplication of demands for divorce. Law for a time yielded to this demand by multiplying the grounds of divorce. Strange as it may seem, this laxity commenced in Connecticut by adding, among other causes, habitual intemperance, intolerable cruelty, "bestiality" and "any such misconduct of the other party as permanently destroys the happiness of the petitioner and defeats the purposes of the marriage relation." Connecticut, in the course of fifteen years, from 1849 to 1864, increased its divorces from 94 to 426, and for the fifteen years following averaged 446 annually. For the last fifteen years, or about to 1880, there had been not quite one divorce for every ten marriages. In Vermont the record for 1878 was one divorce to every fourteen marriages, and Maine and Rhode Island showed the same general increase. Massachusetts, with more accurately compiled statistics, shows that while twenty years ago there was one divorce for every fifty-one marriages, in 1880 the rate was one to twenty-one, while the ratio of marriage to the population had much decreased. The present Governor of Massachusetts makes it a leading subject in his annual message. Indiana, Illinois and Ohio have shown the same tendencies, the State of Ohio, for instance, showing one divorce to every nineteen marriages, and some counties of each of these States surpassing this. In the ratio, too, it would be fair to mostly leave out the Catholic population, since that Church almost ignores the possibility of divorce.

In New York somewhat similar increase has taken place and similar laxity of law has prevailed. At a recent decision of the Court of

Appeals, a divorced defendant, whose remarriage would have been bigamy if married again in that State, is declared legally married because the ceremony was performed in an adjacent State.

In Pennsylvania it has been shown that to every ten marriages there is one divorce. The Court of Common Pleas of Philadelphia has the last year drawn attention thereto. Judge Mitchell said: "There is no doubt that our laws are more lax than even those of Indiana. Unfortunately the judge cannot change the laws." Judge Arnold said: "We shall do our best to eradicate what has become a great evil." It is added that the laws of most of the States need reforming on this subject. In 1878 the divorces in England were one to 300 marriages, which was considered an alarming increase.

It is to the honor of our own State that, much more than most of the surrounding States, it has clung to the sanctity of the family relation. Our system of marriage records has done much to emphasize the fact of State oversight, while some of the restraints upon hasty marriages have not been removed. The courts have, as a rule, been restrictive in their tendencies and viewed marriage as far more than an ordinary contract. Our laws of divorce have not undergone the questionable changes which have occurred in some other States. Full testimony is first taken before a master, and then the Court of Chancery can examine parties, and is strict in the interpretation of the law. The Court of Chancery is searching and strict in its interpretation of the law. Still there have been some undue extensions of facility for family dismemberment. Too often those who perform the ceremony are not careful enough to guard the rights of parents, and the civil right of performing marriages has been unduly extended. The chief need is that there be closer guard against hasty marriages, or marriage of those under age without consent of parents or guardians, and that the number of those authorized to perform the marriage ceremony shall not be inordinately multiplied. Some ministers are too careless in marrying those who marry in haste.

It is because we believe the caution to be timely, and prevention to be much better than an increase of divorces, that we notice the statistics of divorces for the five years since the re-organization of our Bureau of State Statistics. Compare these with the statistics of marriages, since both have to do with the vital oversight of population.

We herewith give a table of the number of divorces which have occurred during the last five years; the number by counties, and the causes for which divorce has been granted.

NUMBER OF DIVORCES GRANTED IN THE STATE OF NEW JERSEY, FOR A PERIOD OF FIVE YEARS, FROM JULY 1st, 1878, TO JULY 1st, 1883, IN YEARLY GROUPS.

Year.	Number Granted.	APPLICANTS.		CAUSES.					
		Husband.	Wife.	Adultery.	Desertion.	Extreme Cruelty.	Bigamy.	Impotence.	Near Relation.
1878–79...	144	59	85	60	78	3	1	2	....
1879–80...	149	51	98	58	86	6	....	1	....
1880–81...	137	50	87	52	79	2	2	1	1*
1881–82...	175	58	117	63	103	5	4	....	....
1882–83...	183	56	127	56	115	7	4	1	....
Totals...	788	274	514	287	461	23	11	5	1

* Married mother-in-law.

NUMBER OF DIVORCES GRANTED BY COUNTIES.

COUNTIES.	1878–79.	1879–80.	1880–81.	1881–82.	1882–83.	Totals.	Population, Census of 1880.
Atlantic........	....	1	1	[illegible]	6	12	18,704
Bergen..........	4	3	4	5	7	23	36,786
Burlington......	5	7	5	5	7	29	55,403
Camden..........	9	6	7	7	11	40	62,942
Cape May........	1	....	1	....	2	4	9,765
Cumberland......	7	5	1	6	3	22	37,687
Essex...........	33	38	41	44	43	199	189,929
Gloucester......	1	2	2	1	4	10	25,886
Hudson..........	28	30	17	34	35	144	187,944
Hunterdon.......	2	3	2	2	4	13	38,570
Mercer..........	9	6	[illegible]	17	10	48	58,061
Middlesex.......	9	6	5	3	8	31	58,286
Monmouth........	5	7	10	5	6	33	55,538
Morris..........	4	2	5	4	4	19	50,861
Ocean...........	1	1	2	3	2	9	14,455
Passaic.........	9	14	14	16	12	65	68,860
Salem...........	1	....	1	....	4	6	24,579
Somerset........	2	4	....	2	4	12	27,163
Sussex..........	1	1	1	2	1	6	23,539
Union...........	10	6	7	6	3	32	55,571
Warren..........	[illegible]	4	1	3	3	14	36,589
Out of State....	....	3	4	6	4	17	....
Totals..........	144	149	137	175	183	788	1,131,117

SUMMARY OF MARRIAGES FOR FIVE YEARS, FROM JULY 1st, 1878, TO JULY 1st, 1883.

YEAR.	Marriages.	Supplement of each year.
1878–79	7,188	171
1879–80	7,935	227
1880–81	8,109	257
1881–82	8,837	745
1882–83	9,116	....
	41,185	1,400
	1,400	
Totals	42,585	

This gives a divorce rate of 18.50 per 1,000 marriages, or 2,000 persons; or, one divorce to every 54 1-24 marriages.

Comparisons with the tables of all the years, as to the number of marriages in each county and with the population, will give further details. The result of these comparisons, and of those with other States, indicates that our system of marriage certificate and of procedure in applications for divorce is mainly correct. But in view of the tendencies and some increase in this State, the conditions and sanctity of marriage should be preserved; the officers performing the ceremony should be those of the higher grades, and the grounds on which divorce is granted should not be multiplied.

CLIMATOLOGY.

The report on this subject last year, as a part of the report of vital statistics, sought to present for permanent reference the ground on which the study of local conditions of climate must rest. In the article on comparative facts in climatology and geology, as needed in the study of vital statistics and the causes of disease, the important facts thus needed as to New Jersey are stated.

This year we complete the full statement of data for five years as to those Stations which are taken to represent the different parts of the State. By reference to these and to former reports all the material is found by which local calculations and comparisons with death-rates can be made.

The places relied upon for our reports are as appears in the tables and in the sixth report.

The tables for Cape May, Barnegat and Sandy Hook were kindly furnished by the Signal Service. The records of New York City, Philadelphia and Easton also admit of comparisons. We are, as before, indebted to the following observers:

I. Newton, Miss E. Foster.
II. Paterson, J. T. Hilton, C.E.
III. Newark, Hon. Wm. A. Whitehead.
IV. New Brunswick, Prof. J. C. Smock.
V. Freehold, Chas. F. Richardson, A.M.
VI. Vineland, John Ingram, M.D.
VII. Cape May and Barnegat, U. S. Signal Service.
VIII. Sandy Hook, U. S. Signal Service.

These tables are deserving of the closest study for the five years, as giving a fair outline of what indicates the weather of each locality. The wonderful range of climate which the State affords cannot but attract attention. There is no other State in the country that affords,

in the same area, so remarkable and ascertainable a diversity. Thus, those who may have occasion to choose climates suited to particular conditions, may here find the climate of the North, that of the extreme South, and such variations as are afforded by soil, protection and special locality.

CONDENSED METEOROLOGICAL RECORDS FOR FIVE STATISTICAL YEARS.

Quinquennial Summaries from July 1st, 1878, to July 1st, 1883, to which is appended a Climatological Table of Means for the State of New Jersey.

STATION, NEWTON, N. J.

Latitude, 41° 2′ 45″ N.; Longitude, 2° 19′ 48″ E. Height of Barometer Cistern above Sea Level, 660 feet.

OBSERVER, MISS E. FOSTER.

	BAROMETER. Reduced to 32°			THERMOMETER.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow (inches).	Days when Precipitation equalled 0.01.	Cloudy Days.	Thunder and Lightning on Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Mon'ly Range.							
1878-79	29.968	28.138	29.287	92.0	-5.0	48.55	41.83	75.49	S.W., N.W.	13.921†	33.0	121	114	13
1879-80	?	?	?	96.0	5.0	53.95	48.53	?	S.W.	?	36.0	83	111	*
1880-81	29.997	28.332	29.167	95.0	-7.9	48.94	48.93	68.53	N.W., S.W.	15.891†	50.45	99	151	11
1881-82	29.983	28.552	29.296	99.0	-6.8	52.44	47.69	72.83	S.W.	43.74	61.5	139	141	30
1882-83	29.932	28.496	29.299	96.1	0.2	50.06	46.03	73.11	S.W., N.E.	41.684	63.7	129	124	25
Mean for 5 years	29.970	28.379	29.362	95.62	-2.9	50.79	46.66	72.49	S.W.	28.8	48.93	114.2	128.6	16.8
Sums	......	......	......	......	......	......	......	......	......	115.234	244.65	571	64.3	84
Extremes	29.997	28.138	......	99.0	-7.9	......	......	......	......	......	......	......	......	......

* Including melted snow. ? No observation. † Record incomplete.

REMARKS.—*Atmospheric Pressure*—The highest daily mean of the barometer occurred in January, 1881. This locality is not affected by areas of high pressure for a longer period than thirty-six hours. Very low depressions do not occur more than four times in a year, and the most rapid changes in winter are not always accompanied by high winds. The months of January, February and March show the widest range. October to May, 1881-2, show a range greatly in excess of the mean.

Temperature—The months of November and February are the ones most frequently marked by sudden changes. The extremest changes do not occur within a shorter period than six hours. The mean daily range of the above period is 15.9°. Highest monthly range was 66°, in April, 1881, being 13° above the mean for that month. August has been the most equable month of all the years.

Humidity—The high humidity of the autumn months causes the first half of each statistical year to show an excess of 3 to 14 per cent. over the latter half. Fogs are mostly the habit of the October, January and February months, those in winter occurring at night.

STATION, CITY HALL, PATERSON, N. J.

Latitude, 40° 55′ N.; Longitude, 74° 11′ W. Height of Rain Gauge above Sea Level, 142 feet.

OBSERVER, JOHN T. HILTON, CITY SURVEYOR.

	Barometer. Reduced to 32°.			Thermometer.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow (inches).	Days when Precipitation equalled 0.01.	Cloudy Days.	Thunder and Lightning on Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Mon'ly Range.							
1878–79	....	....	....	88.0	9.0	50.80	36.40	....	....	47.80	36.0	115	....	....
1879–80	....	....	....	98.0	5.0	54.33	47.33	....	....	45.32	38.0	110	....	....
1880–81	....	....	....	93.0	-6.0	50.41	48.53	....	....	63.48	47.50	114	....	....
1881–82	....	....	....	98.0	-5.0	52.75	40.25	....	....	62.69	38.75	130	....	....
1882–83	....	....	....	96.0	0.0	49.56	40.63	....	....	73.185	59.50	120	....	....
Mean for 5 years	....	....	....	94.6	0.6	51.57	42.63	....	....	62.495	43.95	117.8	....	....
Sums	....	....	....	....	....	....	....	....	....	312.475	219.75	589	....	....
Extremes	....	....	....	98.0	-6.0	....	....	....	....	....	....	....	....	....

* Including melted snow.

REMARKS.—*Temperature*—January—May, 1880 and 1881, had an extremely wide range. Highest monthly range was in May, 1880, 63°, being 16° above the monthly mean.

Rain-fall—The rain of March, 1881, amounting to 16.11 inches, took place at a period when the ground was frozen solidly, and quickly disappeared through the water-courses, hardly moistening the surface of the earth. The drought of 1881 is attributed to the unequal distribution of the rain-fall. During July, August, September and October, there were 98 days on which no rain fell. In September, 1882, occurred the memorable freshet, during which 18 inches of water fell in less than three days. Paterson has an exceptional topographical position as regards the quantity of water that falls on the basin it occupies.

STATION, NEWARK, N. J.

Latitude, 40° 44′ N.; Longitude, 74° 10′ W. Height of Barometer Cistern above Sea Level, 35 feet.

OBSERVER, W. A. WHITEHEAD.

	Barometer. Reduced to 32°.			Thermometer.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow (inches).	Days when Precipitation equalled 0.01.	Cloudy Days.	Thunder and Lightning on Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Mon'ly Range.							
1878–79	30.78	28.85	29.954	98.25	-2.0	53.73	42.98	....	N.W., S.W.	46.105	....	128	99	....
1879–80	30.70	28.85	30.057	99.25	8.0	53.39	49.63	....	N.W., S.W.	41.07	....	94	92	....
1880–81	30.85	29.17	30.022	96.0	-5.0	49.31	46.80	....	N.W., S.W.	47.95	....	115	92	....
1881–82	30.90	29.35	30.064	100.5	3.0	53.64	44.97	....	N.W., S.W.	26.32	....	118	73	....
1882–83	30.93	29.55	30.130	96.5	2.5	51.24	42.73	....	N.W.	51.62	41.5	110	149	....
Mean for 5 years	30.81	29.15	30.045	98.1	1.3	52.34	45.42	....	N.W.	44.653	....	113	101	....
Sums	....	....	....	....	....	....	....	....	....	223.265	....	565	505	....
Extremes	30.93	28.85	....	100.5	-5.0	....	....	....	....	....	....	....	....	....

* Including melted snow.

REMARKS.—*Atmospheric Pressure*—The annual variations have been slight. 1878-79 had the widest monthly range. The range for June and August, 1879, was greatly in excess of the mean.

Temperature—The mean daily range for the above period is 17.4°. Greatest monthly range was 61° in May, 1880, being nearly 9° above the monthly mean. September, 1881, recorded a maximum of 100.5° and a mean of 73.72°. The months of the fourth statistical year show the least deviation from the mean range.

STATION, AGRICULTURAL COLLEGE FARM, NEW BRUNSWICK, N. J.

Latitude, 40° 29′ N.; Longitude, 74° 26′ W., or 2° 37′ E. Height, 115 feet.

OBSERVER, THEODORE WEST.

	BAROMETER. Reduced to 32°.			THERMOMETER.										
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Mon'ly Range.	Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow (inches).	Days when Precipitation equalled 0.01.	Cloudy Days.	Thunder and Lightning on Days.
1878-79	......	......	......	95.0	-8.0	50.12	43.41	......	W S.W.	39.83	......	......	......	......
1879-80	......	......	......	98.0	5.0	52.83	50.58	......	W S.W.	29.33	......	......	......	......
1880-81	......	......	......	95.0	-8.0	48.66	45.06	......	W., S.	44.93	......	......	......	......
1881-82	......	......	......	103.0	-3.0	52.19	43.58	......	W S.W	34.78	......	......	......	......
1882-83	......	......	......	95.0	3.0	47.87	44.41	......	E., W.S.W.	49.12	......	......	......	......
Mean for 5 years	......	......	......	97.2	-2.2	50.33	45.41	......	W.S.W.	39.598	......	......	......	......
Sums	......	......	......	......	......	......	......	......	......	197.99	......	......	......	......
Extremes	......	......	......	103.0	-8.0	......	......	......	......	......	......	......	......	......

* Including melted snow.

REMARKS.—*Temperature*—The winter months show wide ranges. The winters of 1878-79, 1880-81, and 1881-82, were more severe than usual. That of 1880-81 began in November and continued 153 days, of average temperature of 29.28°, (November 22d, 1880, to April 22d, 1881.) Heavy snowfalls; good sleighing for six weeks. Spring of 1879 marked by great changes of temperature. Greatest monthly range [illegible] in May, 1880—8.6° above the average. Rainfall of winter and spring, 1880, much below the mean. Autumn, 1881, noted for its long and severe drought. There was a high percentage of easterly winds in July, August, September and October, 1882.

STATION, FREEHOLD, N. J.

Latitude, 40° 15′ N.; Longitude, 74° 16′ W. Height of Barometer Cistern above Sea Level, 216 feet.

OBSERVER, CHAS. F. RICHARDSON.

	BAROMETER. Reduced to 32°.			THERMOMETER.										
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Mon'ly Range.	Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow (inches).	Days when Precipitation equalled 0.01.	Cloudy Days.	Thunder and Lightning on Days.
1878-79	30.47	28.78	29.74	95.0	-3.0	50.74	44.47	77.14	W.	48.43	27.07	157	84	46
1879-80	30.50	29.24	29.88	97.0	8.0	53.52	52.00	76.33	W	41.84	35.70	119	84	65
1880-81	30.53	28.97	29.81	91.0	-11.0	48.55	48.33	77.14	N.W	61.49	79.70	132	100	66
1881-82	30.51	29.14	29.84	102.0	-3.0	51.69	47.68	75.97	W.	41.11	50.74	144	100	37
1882-83	30.44	29.06	29.75	96.0	1.0	49.75	45.60	77.42	W.	51.87	43.50	139	88	41
Mean for 5 years	30.49	29.03	29.804	96.2	-1.6	50.65	47.61	76.80	W.	48.95	47.34	138.2	91.2	43.4
Sums	......	......	......	......	......	......	......	......	......	244.74	236.71	691	456	217
Extremes	30.53	28.78	......	102.0	-11.0	......	......	......	......	......	......	......	......	......

* Including melted snow.

REMARKS.—*Atmospheric Pressure*—The mean monthly range of the barometer is low. October to May, 1881-82, show a range slightly in excess of the mean.

Temperature—Excepting July and August, all the months have a wide range. The highest monthly range was 60° in May, 1880, while the greatest excess of the mean range was in December, 1880, being [illegible] above the average. There has been a notable increase of the rain-fall in the winter months.

STATION, VINELAND, N. J.

Latitude, 39° 29′ N., Longitude, 75° 01′ W. Height of Barometer Cistern above Sea Level, 111 feet.

OBSERVER, J. INGRAM, M.D.

	Barometer. Reduced to 32°. Max.	Min.	Mean.	Thermometer. Max.	Min.	Mean.	Mean Mon'ly Range.	Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow (inches).	Days when Precipitation equalled 0.01	Cloudy days.	Thunder and Lightning on Days.
1878-79	30.60	29.06	29.40	98.0	−4.4	52.[illegible]	46.[illegible]	76.41	S.W.	67.10	11.[illegible]	90	—	—
1879-80	30.59	29.[illegible]	29.31	97.0	10.6	57.67	38.[illegible]	72.40	S.W.	67.00	26.25	105	—	—
1880-81	30.60	29.[illegible]	29.[illegible]	98.0	−10.5	50.92	[illegible]	72.[illegible]	S.W.	55.59	67.00	102	—	—
1881-82	30.67	29.[illegible]	29.96	104.0	0.6	56.17	45.[illegible]	[illegible].42	S.W.	[illegible].59	29.[illegible]	93	—	—
1882-83	30.61	29.14	29.92	96.0	6.6	53.37	44.[illegible]	[illegible]	S.W., N.W.	54.11	31.75	109	—	—
Mean for 5 years	30.61	29.95	29.90	98.2	−0.1	53.90	48.32	69.06	S.W.	48.36	32.5	100.6	—	—
Sums	—	—	—	—	—	—	—	—	—	206.79	162.5	50[illegible]	—	—
Extremes	30.67	28.66	—	104.0	−20.5	—	—	—	—	—	—	—	—	—

* Including melted snow.

REMARKS.—*Atmospheric Pressure*—The first and fifth statistical years are near the average. October to March (inclusive) have a wide range in all the years, excepting December and January, 1879-80.

Temperature—The year 1878-79 is near the average, while 1879-80 is above the average by [illegible] per cent., and over [illegible] per cent. above 1880-81. The winter of 1880-81 was of extraordinary severity. There were [illegible] frosty days, and [illegible] days during which the temperature was below 32° for the entire day; and during the months of December, 1880, and January and February, 1881, the mean temperature was [illegible], with extremes of [illegible] and −20.5°. These fluctuations in temperature have given an extremely wide and variable range to the above series. January, 1879, had a monthly range of 67°, 11.5° above the mean. The drought of 1881 was severe and long continued.

STATION, CAPE MAY, N. J.

Latitude, 38° 56′ N., Longitude, 74° 58′ W. Height of Barometer Cistern above Sea Level, 27 feet.

OBSERVER, U. S. SIGNAL SERVICE.

	Barometer. Reduced to 32°. Max.	Min.	Mean.	Thermometer. Max.	Min.	Mean.	Mean Mon'ly Range.	Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow	Days when Precipitation equalled 0.01	Cloudy Days	Thunder and Lightning on Days
1878-79	30.74	29.44	29.[illegible]	96.0	1.0	53.63	37.32	74.74	N.W.	42.44	—	118	109	—
1879-80	30.41	29.[illegible]	[illegible]	[illegible]	12.0	57.[illegible]	[illegible]	74.6[illegible]	"	50.[illegible]	—	125	116	—
1880-81	30.[illegible]	29.[illegible]	[illegible]	[illegible]	2.0	53.[illegible]	[illegible]	75.4[illegible]	N.W.	40.54	—	164	130	—
1881-82	30.[illegible]	29.1[illegible]	[illegible]	[illegible]	5.0	54.33	35.66	75.46	N.W.	[illegible]	—	164	125	—
1882-83	30.76	29.[illegible]	[illegible]	[illegible]	11.0	54.71	33.[illegible]	77.[illegible]	S.	54.63	—	127	79	—
Mean for 5 years	30.79	29.11	30.05	96.4	6.2	54.42	36.34	75.06	N.W.	49.81	—	131.3	108.2	—
Sums	—	—	—	—	—	—	—	—	—	249.06	—	656	541	—
Extremes	30.[illegible]	29.[illegible]	—	[illegible]	1.0	—	—	—	—	—	—	—	—	—

* Including melted snow.

REMARKS.—The mean temperature of the winter months is 36.[illegible]°, the second statistical year having the highest, and the third the lowest mean. The higher annual mean of 1879-80 is doubtless owing to the increase of temperature of the winter months.

The above record gives expression to the same results reached by careful comparison of months, years and seasons. For evenness of pressure, temperature and moisture, Cape May has been justly indicated as a remarkable locality.

STATION, BARNEGAT, N. J.

Latitude, 39° 48′ N.; Longitude, 74° 9′ W. Height of Barometer Cistern above Sea Level, 20 feet.

OBSERVER, U. S. SIGNAL SERVICE.

	Barometer. Reduced to 32°.			Thermometer.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation equalled 0.01.	Cloudy Days.	Thunder and Lightning on Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Mon'ly Range.							
1878-79	30.76	28.80	29.996	94.0	-1.0	50.61	39.25	78.84	N.W.	49.38	.....	148	91	....
1879-80	30.79	29.09	30.060	96.0	[illegible]	53.40	36.08	78.72	N.W.	47.27	.....	153	107	....
1880-81	30.78	29.03	30.002	94.0	-7.0	49.06	44.50	78.58	N.W.	60.13	.....	156	128	....
1881-82	30.82	29.12	30.045	96.0	-1.0	53.03	40.81	78.89	S., N.W.	58.85	.....	139	118	....
1882-83	30.78	29.12	30.043	93.5	6.4	51.90	[illegible]	79.29	E., N.W.	59.78	.....	143	110	....
Mean for 5 years	30.78	29.03	30.029	94.5	1.48	51.80	[illegible]	78.86	N.W.	55.08	...	148.2	110.8	....
Sums	......	......	......	......	......	......	......	......	......	275.41	.....	741	554	....
Extremes	30.82	28.80	......	96.0	-7.0	......	......	......	......	......	.....	......	......	....

* Including melted snow.

REMARKS.—The monthly ranges have been equable, excepting in January, February and March. Greatest monthly range 62° in January, 1879, is 17° above the mean. The range of the winter months in 1880 was low. The mean temperature of the winter months is 35.28°. The first, third and fifth statistical years were below the mean

Rains were well distributed by months, excepting through the summer of 1881.

STATION, SANDY HOOK, N. J.

Latitude, 40° 28′ N.; Longitude, 74° 1′ W. Height of Barometer Cistern above Sea Level, 28 feet.

OBSERVER, U. S. SIGNAL SERVICE.

	Barometer Reduced to 32°.			Thermometer.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow (inches).	Days when Precipitation equalled 0.01.	Cloudy Days	Thunder and Lightning on Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Mon'ly Range.							
1878-79	30.75	28.77	29.978	97.0	-3.0	51.60	40.41	73.68	W.	60.37	.....	127	118	....
1879-80	30.77	29.33	30.044	96.0	10.0	55.16	46.25	72.46	S.W., N.W.	46.76	.....	118	116	....
1880-81	30.80	29.02	29.994	92.0	-5.0	50.64	44.40	73.62	N.W.	53.14	.....	126	102	....
1881-82	30.82	29.21	30.040	101.0	0.0	54.50	41.23	74.26	N.W.	46.30	.....	140	95	....
1882-83	30.75	29.24	30.045	92.5	3.0	52.00	40.50	76.15	N.E., S.E.	45.23	.....	124	88	....
Mean for 5 yrs.	30.77	29.11	30.02	95.7	1.0	52.78	42.49	74.06	N.W.	50.936	.....	127	104.2	....
Sums	......	......	......	......	......	......	......	......	......	251.69	....	635	521	....
Extremes	30.82	28.77	......	101.0	-5.0	......	......	......	......	......	....	......	......	....

* Including melted snow.

REMARKS.—The monthly ranges were very equable. Mean temperature of the winter months is [illegible]. The first, third and fifth statistical years were below the mean, although the variations from the mean were not so extreme as at coast stations farther southward.

CLIMATE OF NEW JERSEY.

Table of Means for the Period from July 1st, 1878, to July 1st, 1883—Five Years.

STATIONS.	Altitude.	Barometer. Reduced to 32°. Max.	Min.	Mean.	Monthly Range.	Thermometer. Max.	Min.	Mean.	Monthly Range.	Mean Humidity.	Rain and Melted Snow.	Snow (inches).	Days when Precipitation equalled 0.01.	Cloudy Days.
Newton	660	29.97	28.37	29.362	1.038	95.6	-2.9	50.70	46.66	72.49	28.80	48.93	114.2	128.6
Paterson	60	....	....	....	....	94.6	0.6	51.57	42.63	....	62.496	43.96	117.8	....
Newark	35	30.81	29.15	30.046	.898	94.1	1.3	52.34	45.42	....	44.653	....	113.0	101.0
New Brunswick	90	....	....	....	....	97.2	-2.2	50.33	45.41	....	39.698	....	....	....
Freehold	190	30.49	29.03	29.604	.844	96.2	-1.6	50.80	47.61	76.80	48.95	47.34	138.2	91.3
Vineland	119	30.61	28.95	29.900	.915	93.2	-0.1	53.90	49.32	69.96	49.36	32.60	100.8	....
Cape May	27	30.78	29.11	30.027	.929	88.4	6.2	54.82	36.56	75.46	49.81	....	131.2	108.3
Barnegat	20	30.78	29.03	30.029	.991	94.5	1.48	51.60	39.40	76.66	55.04	....	148.2	110.8
Sandy Hook	28	30.77	29.11	30.020	.984	95.7	1.0	52.78	42.49	74.05	50.938	....	127.0	104.2
For the State	....	30.60	28.96	29.884	.9396	95.39	0.42	52.19	43.94	74.62	47.71	43.18	123.8	107.3

NUMBER OF MARRIAGES, BIRTHS AND DEATHS, BY TOWNSHIPS.

FOR THE YEAR ENDING JUNE 30, 1883.

ATLANTIC COUNTY.

	M.	B.	D.
Absecon	7	10	12
Atlantic City	67	100	144
Buena Vista	1	18	12
Egg Harbor City	22	39	23
Egg Harbor Township	32	66	56
Galloway	4	34	34
Hamilton	7	32	28
Hammonton	13	38	25
Mullica	2	12	19
Weymouth	3	13	8
	158	362	361

BERGEN COUNTY.

	M.	B.	D.
Englewood	15	37	67
Franklin	12	42	23
Harrington	7	21	39
Hohokus	13	52	35
Lodi	15	77	71
Midland	12	23	33
New Barbadoes	41	125	102
Palisade	10	25	48
Ridgefield	15	34	64
Ridgewood	9	18	35
Saddle River	2	23	24
Union	8	31	52
Washington	9	58	49
	173	676	642

BURLINGTON COUNTY.

	M.	B.	D.
Bass River	2	19	10
Beverly	17	21	46
Bordentown	58	186	90
Burlington City	54	132	134
Chester	31	61	30
Chesterfield	8	16	25
Cinnaminson	9	48	34
Delran	14	13	25
Eastampton	1	15	11
Evesham	10	33	34
Florence	9	49	24
Little Egg Harbor	15	54	25
Lumberton	4	17	10
Mansfield	12	34	21
Medford	9	38	37
Mt. Laurel	1	21	20
New Hanover	18	34	37
Northampton	61	88	92
Pemberton	26	56	49
Randolph	4	10	6
Shamong	5	5	13
Southampton	11	43	16
Springfield	3	40	14
Washington	1	11	8
Westampton	1	9	7
Willingboro	1	13	10
Woodland	1	5	2
	386	1,021	830

CAMDEN COUNTY.

	M.	B.	D.
Camden	451	762	834
Centre	5	35	39
Delaware	3	20	23
Gloucester City	44	134	117
Gloucester	14	75	77
Haddon	20	59	52
Stockton	7	60	77
Waterford	12	36	35
Winslow	16	43	37
	572	1,224	1,291

CAPE MAY COUNTY.

	M.	B.	D.
Cape May City	11	54	27
Dennis	7	36	22
Lower	15	49	20
Middle	10	47	40
Upper	10	29	22
	58	215	131

CUMBERLAND COUNTY.

	M.	B.	D.
Bridgeton	90	255	135
Commercial	11	15	30
Deerfield	17	21	26
Downe	14	25	18
Fairfield	25	72	35
Greenwich	10	21	12
Hopewell	9	35	20
Landis	51	142	98
Maurice River	10	47	36
Millville	71	244	140
Stoe Creek	5	26	10
	313	903	550

ESSEX COUNTY.

	M.	B.	D.
Belleville	16	68	54
Bloomfield	44	155	102
Caldwell	10	33	37
Clinton	18	50	39
East Orange	31	199	127
Franklin	10	29	26
Livingston	6	10	13
Milburn	9	41	35
Montclair	31	147	80
Newark	1,338	3,952	3,480
Orange	123	418	288
South Orange	19	78	53
West Orange	7	62	60
	1,662	5,242	4,394

GLOUCESTER COUNTY.

	M.	B.	D.
Clayton	17	49	22
Deptford	....	39	30
East Greenwich	9	19	26
Franklin	11	61	42
Glassboro	25	59	43
Greenwich	12	47	19
Harrison	12	59	37
Logan	1	26	22
Mantua	9	43	19
Monroe	14	46	28
South Harrison	....	1	....
Washington	7	25	28
West Deptford	2	19	14
Woodbury	30	65	52
Woolwich	16	52	30
	165	610	407

HUDSON COUNTY.

	M.	B.	D.
Bayonne	61	251	196
Guttenberg	13	48	26
Harrison	31	164	158
Hoboken	349	783	808
Jersey City	948	1,571	3,106
Kearny	8	83	40
North Bergen	19	50	287
Town of Union	83	174	209
Union	2	44	37
Weehawken	64	15	35
West Hoboken	....	171	152
	1,578	3,299	4,996

HUNTERDON COUNTY.

	M.	B.	D.
Alexandria	4	16	17
Bethlehem	13	40	28
Clinton	4	21	20
Delaware	29	60	44
East Amwell	18	30	17
Franklin	15	31	18
Frenchtown	13	19	26
High Bridge	7	39	35
Holland	8	24	30
Kingwood	11	28	29
Lambertville	47	81	57
Lebanon	25	61	48
Raritan	18	48	72
Readington	16	60	37
Tewksbury	12	36	34
Town of Clinton	10	17	13
Union	9	6	15
West Amwell	2	12	9
	261	629	549

MERCER COUNTY.

	M.	B.	D.
Chambersburg	47	168	119
East Windsor	26	24	39
Ewing	8	20	81
Hamilton	10	66	94
Hopewell	22	65	60
Lawrence	6	26	26
Millham	4	68	43
Princeton	27	61	75
Trenton	347	683	622
Washington	....	15	14
West Windsor	5	27	13
	502	1,168	1,186

MIDDLESEX COUNTY.

	M.	B.	D.
Cranbury	16	39	20
East Brunswick	31	71	50
Madison	1	25	21
Monroe	23	45	37
New Brunswick	150	432	400
North Brunswick	13	28	13
Perth Amboy	55	216	189
Piscataway	27	63	59
Raritan	20	49	56
Sayreville	21	20	24
South Amboy	31	74	69
South Brunswick	9	48	49
Woodbridge	23	85	88
	420	1,195	1,085

MONMOUTH COUNTY.

	M.	B.	D.
Atlantic	6	20	20
Eatontown	24	42	54
Freehold	45	89	74
Holmdel	7	22	23
Howell	38	58	50
Manalapan	17	27	41
Marlboro	14	31	32
Matawan	25	57	69
Middletown	32	65	67
Millstone	12	25	23
Neptune	54	123	136
Ocean	63	204	133
Raritan	51	106	90
Shrewsbury	40	114	117
Upper Freehold	25	57	42
Wall	48	134	67
	501	1,174	1,038

MORRIS COUNTY.

	M.	B.	D.
Boonton	27	81	65
Chatham	25	56	78
Chester	20	65	34
Hanover	19	46	105
Jefferson	9	14	31
Mendham	15	20	29
Montville	7	19	22
Morristown	48	119	193
Mt. Olive	18	45	36
Passaic	9	10	16
Pequannock	10	72	38
Randolph	71	210	131
Rockaway	33	151	112
Roxbury	16	51	39
Washington	14	54	48
	341	1,018	977

OCEAN COUNTY.

	M.	B.	D.
Berkeley	....	22	12
Brick	21	33	26
Dover	20	65	27
Eagleswood	5	10	7
Jackson	10	39	28
Lacey	4	29	13
Manchester	6	20	18
Ocean	1	7	12
Plumsted	8	38	23
Stafford	17	21	22
Union	15	17	15
	107	294	203

PASSAIC COUNTY.

	M.	B.	D.
Acquackanonk	6	34	24
Little Falls	13	15	38
Manchester	....	19	15
Passaic	67	247	186
Paterson	594	1,617	1,415
Pompton	25	87	35
Wayne	2	47	21
West Milford	24	57	25
	731	2,073	1,709

SALEM COUNTY.

	M.	B.	D.
Elsinboro	....	9	10
Lower Alloways Creek	4	18	13
Lower Penn's Neck	7	9	26
Mannington	3	15	44
Oldmans	11	29	27
Pilesgrove	21	56	59
Pittsgrove	16	52	32
Quinton	2	25	24
Salem	50	115	117
Upper Alloways Creek	8	31	21
Upper Penn's Neck	22	38	26
Upper Pittsgrove	9	29	18
	153	426	416

SOMERSET COUNTY.

	M.	B.	D.
Bedminster	8	41	85
Bernards	15	42	28
Branchburg	8	16	11
Bridgewater	71	150	[illegible]
Franklin	19	38	69
Hillsborough	17	59	51
Montgomery	12	45	83
North Plainfield	13	57	48
Warren	5	19	21
	168	467	449

SUSSEX COUNTY.

	M.	B.	D.
Andover	10	13	21
Byram	18	33	21
Frankford	18	16	35
Green	8	15	3
Hardyston	14	3	28
Hampton	4	10	13
Lafayette	6	5	5
Montague	7	2	8
Newton	30	29	39
Sandyston	7	9	14
Sparta	21	19	41
Stillwater	18	30	12
Vernon	12	20	20
Walpack	6	3	3
Wantage	19	40	67
	198	249	315

UNION COUNTY.

	M.	B.	D.
Clark	....	1	7
Cranford	6	18	12
Elizabeth	241	831	686
Fanwood	....	25	24
Linden	13	30	32
New Providence	2	19	12
Plainfield	57	191	161
Rahway	56	117	131
Springfield	4	21	12
Summit	11	46	38
Union	11	27	35
Westfield	16	42	38
	417	1,368	1,188

WARREN COUNTY.

	M.	B.	D.
Allamuchy		4	2
Belvidere	12	31	35
Blairstown	16	30	22
Franklin	18	28	19
Frelinghuysen	8	10	8
Greenwich	15	17	18
Hackettstown	40	55	48
Hardwick	1	8	5
Harmony	9	29	14
Hope	8	38	28
Independence	14	5	18
Knowlton	17	31	17
Lopatcong	2	36	23
Mansfield	4	21	27
Oxford	26	123	81
Pahaquarry	3	7	3
Phillipsburg	82	251	147
Pohatcong	7	32	20
Washington Borough	18	56	36
Washington Township	7	15	25
	307	822	591

TOTALS OF MARRIAGES, BIRTHS AND DEATHS FOR ALL THE COUNTIES.

	M.	B.	D.
Atlantic	158	362	361
Bergen	173	676	642
Burlington	386	1,021	839
Camden	572	1,224	1,291
Cape May	53	215	131
Cumberland	313	903	550
Essex	1,662	5,242	4,394
Gloucester	165	610	407
Hudson	1,578	3,299	4,996
Hunterdon	261	629	549
Mercer	502	1,168	1,188
Middlesex	420	1,195	1,063
Monmouth	501	1,174	1,038
Morris	341	1,018	977
Ocean	107	294	203
Passaic	731	2,073	1,709
Salem	158	426	416
Somerset	168	467	449
Sussex	198	249	315
Union	417	1,368	1,188
Warren	307	822	591
	9,166	24,490	23,810

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1883.

COUNTIES. Statistical Divisions.	DEATHS AT ALL AGES: Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.
Atlantic	88	53	27	104	88	361	18,704	19.30
Bergen	138	91	60	172	178	642	36,786	17.45
Burlington	168	85	61	261	247	830	55,403	14.98
Camden	343	162	122	396	256	1,291	62,942	20.51
Cape May	30	7	9	39	44	131	9,765	13.41
Cumberland	129	39	64	145	166	550	37,687	14.59
Essex	1046	648	469	1414	774	4,394	189,929	23.13
Gloucester	60	51	34	115	120	407	25,886	15.72
Hudson	1368	1006	486	1606	581	4,998	187,944	26.58
Hunterdon	87	62	61	136	198	549	38,570	14.23
Mercer	243	146	113	377	287	1,188	58,061	20.46
Middlesex	232	162	123	312	226	1,085	52,286	20.75
Monmouth	216	113	96	298	287	1,038	55,538	18.69
Morris	176	121	107	271	271	977	50,861	19.21
Ocean	46	16	23	63	53	203	14,455	14.04
Passaic	496	234	171	489	296	1,709	68,860	24.82
Salem	97	35	40	112	127	416	24,579	16.92
Somerset	80	53	36	122	155	449	27,162	16.53
Sussex	38	30	33	110	100	315	23,539	13.38
Union	260	196	146	342	238	1,188	55,571	21.37
Warren	119	64	55	176	147	591	36,589	16.15
Totals	5378	3412	2338	7060	4827	23,310	1,131,117	20.60

COUNTIES.	PRINCIPAL CAUSES OF DEATH: Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrhœal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Atlantic	2	6	......	2	1	1	27	54	24	21	25	22	19	11	27	10	13	11	......	6	10
Bergen	12	8	......	18	1	4	30	58	33	29	92	39	43	30	48	4	31	14	2	3	35
Burlington	10	26	4	4	1	9	35	71	43	81	70	64	62	24	74	1	40	34	......	6	26
Camden	18	60	1	30	1	6	46	166	72	94	116	92	52	32	102	3	52	23	1	7	33
Cape May	2	4	......	1	......	......	5	14	7	16	13	4	5	4	20	1	1	4	......	......	5
Cumberland	......	26	......	8	1	1	17	66	30	60	71	36	35	13	46	2	19	13	......	4	13
Essex	46	101	1	300	18	53	210	437	366	311	532	316	206	168	203	18	233	67	9	53	140
Gloucester	3	6	......	3	4	1	14	47	21	36	48	24	33	12	37	2	23	12	......	3	17
Hudson	56	114	4	210	68	47	319	641	309	300	674	481	216	149	236	16	237	80	1	49	247
Hunterdon	7	11	......	25	4	2	33	52	20	37	55	21	36	18	57	4	21	9	1	6	18
Mercer	9	32	2	14	2	2	71	128	103	75	107	65	55	42	104	4	51	27	6	5	46
Middlesex	7	21	......	34	5	10	104	137	70	79	121	61	44	43	67	2	38	25	1	2	49
Monmouth	9	24	......	15	1	4	52	123	69	71	102	51	66	37	83	3	41	29	1	9	45
Morris	23	20	......	37	4	4	30	70	60	53	145	70	66	31	102	6	22	16	4	7	33
Ocean	......	4	1	5	......	3	5	22	17	16	25	13	5	7	15	1	4	2	......	3	6
Passaic	32	43	39	42	4	25	41	266	115	109	184	164	61	51	56	1	49	29	6	15	50
Salem	7	11	2	1	2	3	12	45	26	30	66	15	19	15	35	2	13	10	......	2	13
Somerset	11	11	......	10	3	5	16	41	22	29	63	28	34	16	40	1	16	11	1	......	16
Sussex	8	9	......	4	......	1	23	16	21	29	36	17	22	11	28	3	7	5	......	3	6
Union	21	26	......	60	2	9	46	149	79	76	148	66	74	29	53	3	33	22	1	9	57
Warren	7	11	......	27	7	......	29	49	28	57	74	39	29	17	50	1	17	8	......	4	33
Totals	290	564	54	853	131	189	1146	2606	1527	1594	2736	1663	1235	759	1563	90	923	461	33	198	907

Death-rate per 1,000 from these diseases, exclusive of accidents, 19.80. Note that consumption has two columns.

Return of Deaths from all Causes and Certain Specified Diseases, in the Cities of the State of New Jersey, of over 5,000 Population, for the Year ending June 30th, 1883.

Cities Having Over 5,000 Population. Statistical Divisions	Deaths at All Ages. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Principal Causes of Death. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption M.	Consumption F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulat'n.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intest'l diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Atlantic County.																													
Atlantic City	46	37	11	39	21	144	5,477	*26.29	......	3	......	......	......	1	16	29	9	9	10	10	10	2	8	10	3	4	......	3	5
Burlington County.																													
Bordentown	16	11	11	25	23	90	6,334	16.87	1	1	......	1	1	......	6	......	7	8	5	6	9	2	8	1	1	2	......	1	1
Burlington	20	19	9	46	39	134	7,257	18.51	....	2	1	......	......	......	3	6	5	18	12	9	11	7	12	....	5	5	......	1	8
Camden County.																													
Camden City	229	111	78	265	145	834	41,659	20.01	13	39	1	18	1	2	30	111	30	63	66	64	51	30	68	2	16	15	1	2	21
Gloucester City	33	14	16	30	20	117	5,347	21.88	1	1	......	2	......	1	4	17	5	7	12	7	7	3	5	......	....	1	......	2	6
Cumberland County.																													
Bridgeton	30	6	19	35	41	135	8,722	15.46	......	11	......	......	......	......	2	12	7	13	21	9	11	1	13	......	9	1	......	1	5
Millville	39	13	31	44	22	140	7,660	14.77	...	4	......	6	......	1	9	19	11	17	17	5	6	6	6	2	3	4	......	1	2
Essex County.																													
Newark	530	531	393	1135	576	3,480	136,508	25.49	30	89	1	271	8	37	182	354	297	245	404	254	157	135	237	14	167	60	9	39	115
Orange	78	41	26	94	44	288	13,207	21.80	1	4	......	16	2	6	7	25	28	23	47	25	12	9	9	2	17	7	......	4	8
Hudson County.																													
Bayonne	57	39	19	62	19	196	9,372	20.91	1	4	......	8	1	3	9	40	7	14	25	19	6	7	8	1	8	3	......	......	16
Harrison	40	28	17	47	20	153	6,[illegible]	22.18	2	13	......	18	......	4	3	19	10	8	15	16	2	2	6	1	4	1	1	2	9
Hoboken	213	165	61	294	69	808	30,999	25.90	3	14	1	26	4	3	61	111	57	45	102	79	40	21	39	6	34	17	......	11	40
Jersey City	773	633	313	940	172	3,108	120,722	25.74	29	65	2	150	52	34	178	403	171	194	412	314	133	85	135	10	164	48	......	29	151
Town of Union	56	60	37	39	17	209	5,849	35.73	6	4	......	8	4	1	52	24	14	8	30	15	8	4	7	......	4	4	......	1	2
Mercer County.																													
Chambersburg	31	16	19	27	20	119	5,437	21.88	1	7	......	......	......	......	14	16	8	4	13	9	3	4	7	......	6	1	......	......	......
Trenton	144	100	59	183	134	622	29,910	20.79	7	16	2	14	2	2	42	75	59	37	53	38	27	17	38	2	28	12	4	3	20
Middlesex County.																													
New Brunswick	103	85	62	119	86	460	17,166	26.79	2	7	......	23	4	6	61	65	28	32	52	30	14	28	22	2	16	11	......	1	16
Morris County.																													
Morristown	27	34	24	51	60	198	6,637	28.96	5	2	......	2	1	......	17	16	11	15	37	13	8	5	18	1	2	8	......	2	5
Passaic County.																													
Passaic	41	26	15	33	20	136	6,532	20.82	1	7	......	6	......	4	2	22	4	10	15	11	9	6	3	......	1	2	1	2	7
Paterson	416	210	145	409	225	1,415	51,031	27.72	30	51	39	35	4	18	38	224	100	90	154	132	60	42	45	1	42	25	4	11	32
Salem County.																													
Salem City	27	8	9	25	39	117	5,036	23.14	2	......	2	......	......	1	4	8	10	10	20	6	5	5	16	......	3	2	......	1	3
Union County.																													
Elizabeth	166	141	91	174	111	688	28,229	24.30	11	18	......	48	1	8	31	92	43	30	76	62	40	13	23	2	23	11	......	8	33
Plainfield	43	23	16	45	32	161	8,125	19.81	......	2	......	3	......	1	7	29	11	11	23	9	9	5	2	......	4	5	1	2	6
Rahway	23	10	15	43	36	131	6,455	20.29	3	2	......	6	......	......	2	15	10	10	16	8	6	4	10	......	2	3	......	1	4
Warren County.																													
Phillipsburg	39	34	9	38	21	147	7,181	20.46	1	8	......	6	2	......	21	17	7	7	11	9	3	1	13	......	2	1	......	1	6
Totals	3530	2385	1468	4,285	2302	14,033	576,990	24.30	140	344	19	657	87	132	801	1779	969	947	1651	1162	852	450	758	57	664	252	21	124	627

Death-rate per 1,000, from these diseases, exclusive of accidents, 23.30. * See note page 349.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1883.

ATLANTIC COUNTY. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Absecon	3	3	2	3	1	12	507	......	......	......	......	......	......	......	2	3	1	......	......	1	......	......	......	......	1	......	......	......	1
Atlantic City	46	27	11	39	21	144	5,477	*26.29	......	3	......	......	......	1	16	29	9	9	10	10	10	2	8	12	3	4	......	3	5
Buena Vista	1	3	1	1	6	12	895	......	......	......	......	......	......	......	2	1	......	1	......	......	......	......	2	......	......	......	......	......	......
Egg Harbor City	5	3	3	5	7	23	1,232	......	......	......	......	1	......	......	1	4	......	......	2	4	......	1	2	......	2	1	......	1	......
Egg Harbor Township	12	8	......	21	14	55	3,568	......	1	......	......	......	......	......	1	8	3	6	7	2	5	4	4	......	1	1	......	1	1
Galloway	7	3	1	14	9	34	2,237	......	......	2	......	......	......	......	......	2	7	7	2	2	2	3	5	......	......	1	......	......	......
Hamilton	4	3	4	6	10	28	1,464	......	......	......	......	......	......	......	3	2	4	3	2	1	......	1	2	......	1	1	......	1	......
Hammonton	4	2	1	9	9	25	1,776	......	1	1	......	1	......	......	......	1	4	......	1	1	1	......	......	......	2	2	......	......	1
Mullica	3	1	3	4	8	19	717	......	......	......	......	......	......	......	1	2	1	......	1	1	1	......	1	......	2	1	......	......	1
Weymouth	3	......	1	1	3	8	741	......	......	......	......	......	1	......	......	1	......	......	......	......	......	......	2	......	1	......	......	......	1
Totals	55	55	27	104	88	351	18,704	19.30	2	6	......	2	1	1	27	54	24	21	25	22	19	11	27	12	13	11	......	6	10

Death-rate per 1,000, without cities of over 5,000 population, 16.40.

* This and all other cities of health resort have an excessive death-rate by reason of temporary increase of population, generally including a proportion of invalids above the average. Local Boards keep a record as to this.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1883.

BERGEN COUNTY. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Englewood	9	7	6	25	21	67	4,076	......	......	3	......	1	......	1	2	7	4	4	14	2	4	......	7	......	4	2	......	......	3
Franklin	10	2	1	9	6	28	2,276	......	......	......	......	......	......	......	1	4	1	......	2	3	4	2	1	......	1	......	......	......	......
Harrington	7	2	4	10	16	39	2,570	......	......	1	......	2	......	......	3	1	2	2	4	2	3	3	7	......	2	1	......	......	1
Hohokus	5	2	5	11	12	35	2,920	......	1	1	......	......	......	......	1	1	3	......	7	......	1	2	2	......	......	3	......	......	5
Lodi	21	14	7	13	14	71	4,071	......	......	3	......	5	......	......	1	10	1	6	4	6	5	1	5	2	5	......	......	1	4
Midland	3	5	2	9	14	33	1,591	......	......	......	......	......	......	......	2	1	......	3	5	1	3	2	8	......	1	......	......	1	......
New Barbadoes	30	20	10	21	21	102	4,248	......	1	......	......	10	......	1	3	15	1	1	13	6	9	5	3	......	4	1	1	1	2
Palisade	9	9	4	8	13	43	2,592	......	......	......	......	......	......	1	6	2	......	3	7	5	2	2	4	......	......	1	......	......	3
Ridgefield	12	8	8	22	15	64	3,952	......	4	......	......	......	......	1	......	5	4	2	12	4	3	4	5	......	3	3	......	......	7
Ridgewood	7	6	2	8	9	35	1,478	......	......	......	......	......	1	......	......	6	1	2	3	4	2	3	3	......	2	......	......	......	......
Saddle River	4	3	3	8	6	24	1,355	......	1	......	......	......	......	......	......	......	2	3	4	1	......	1	1	......	4	......	......	......	2
Union	8	7	7	17	13	52	3,161	......	4	......	......	......	......	......	1	3	3	3	8	5	4	2	......	1	2	1	1	......	6
Washington	11	6	1	11	20	49	2,853	......	1	......	......	......	......	......	......	3	1	2	11	......	2	3	5	1	3	2	......	......	2
Totals	136	91	60	172	178	642	36,786	17.45	12	8	......	16	1	4	20	58	23	29	92	39	42	30	48	4	31	14	2	3	36

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1883.

BURLINGTON COUNTY. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined	Population, census of 1880	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption, M.	Consumption, F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bass River	3	2		2	3	10	1,006								1	3	1	1				1	2						
Beverly	6	10	5	17	8	46	3,128					1			2	6	2	4	1	3	3	1	6		2	2			3
Bordentown	16	11	11	25	23	90	5,334	16.67	1	1		1	1		6		7	5	5	6	9	2	8	1	1	3		1	1
Burlington	20	19	9	46	39	131	7,237	18.51		2	1				3	6	6	16	12	9	11	7	12		5	6		1	5
Chester	4		1	14	12	30	2,605									3	2	3			5	1	7		2	2			
Chesterfield	4	2		6	13	25	1,525									3	3	1	3	1	2	2	5			1			
Cinnaminson	8	5	2	7	8	24	2,164		2	2				1		4	1	2		5	4		2		6				1
Delran	8		3	7	7	25	1,760			3						2	3	1	1	3					3				
Evesham	9	3	3	13	6	34	1,602		1	1	3	1		1		4	1		1	5	3	1	2		1			1	1
Eastampton	3	1	1	5	1	11	566									3	2	1		2			1						
Florence	6	3	3	9	3	24	1,324			1					3	1	4	2	2	1	2		3					1	
Little Egg Harbor	7	1	1	7	9	25	1,551							2			2	3	3	1	2		1		1	1			1
Lumberton	2		3	2	3	10	1,669							1			1	3	1	1					2				
Mansfield	5	1	1	8	6	21	1,613							1	1	2	1	3		2	1	1	1						3
Medford	7	2	1	11	16	37	1,980			3				1		4	1	5	4	3	4	1	5		2	1			
Mt. Laurel	7	2		5	7	20	1,739		1	1						2	1	1	4	3		3	1						1
New Hanover	5	3	4	12	9	37	2,373			3					1	4	1	3	3	1	4		6		2	2		1	1
Northampton	20	9	5	25	33	92	4,630		2	4		1		1	4	10	1	16	9	4	5		7		4	1			4
Pemberton	9	6	2	11	20	49	2,885		1	3					2	7	2	2	7	1	4	2	4		5	3			
Randolph	1	1		3	1	6	428							1			1			1		1	1						
Shamong	3			6	4	13	1,097			1						1	1	1	4	1	1		1						1
Southampton	5	1	2	1	7	16	2,269									4			4						2	1			1
Springfield	6	3		6	3	14	1,996									2	1		2	1	1				1	1			1
Washington	1		1	2	4	8	359			1					1		1	2											
Westampton		1	2	2	2	7	715		1						1			2			1								
Willingboro	2		1	6	1	10	743		1									1		1		1	1			1		1	
Woodland					2	2	325												2										
Totals	168	55	61	261	247	830	56,403	14.98	10	26	4	4	1	9	25	71	43	61	70	54	62	24	74	1	40	24		6	25

Death-rate per 1,000, without cities of over 5,000 population, 14.14.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1883.

CAMDEN COUNTY. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Camden	229	111	78	265	145	834	41,659	20.01	12	39	1	18	1	2	30	111	50	63	66	64	51	30	68	2	16	15	1	2	21
Centre	9	6	4	9	10	39	1,532	......	......	2	......	......	......	2	2	3	2	3	3	4	3	......	2	1	......	2	......	......	2
Delaware	4	2	5	6	6	23	1,481	......	......	......	......	1	......	......	3	3	2	2	3	1	1	......	......	......	1	......	......	......	......
Gloucester City	33	14	16	30	20	117	5,347	21.88	1	1	......	2	......	1	4	17	5	7	12	7	7	3	5	......	......	1	......	2	6
Gloucester	13	4	5	33	22	77	2,527	......	......	2	......	1	......	1	......	6	4	6	6	5	9	1	10	......	8	2	......	1	5
Haddon	9	9	4	11	19	52	2,551	......	2	2	......	2	......	......	5	8	......	3	10	2	4	3	4	......	2	......	......	1	1
Stockton	19	9	6	21	20	77	3,532	......	1	4	......	1	......	......	2	7	2	7	12	4	7	2	5	......	2	2	......	1	1
Waterford	10	1	2	13	9	35	2,149	......	......	......	......	......	......	......	......	6	5	3	4	2	......	1	4	......	3	......	......	......	......
Winslow	17	6	2	8	4	37	2,158	......	1	......	......	5	......	......	......	8	2	......	......	3	......	2	4	......	......	1	......	......	3
Totals	343	162	122	396	255	1,291	62,942	20.51	18	50	1	30	1	6	46	166	72	91	116	93	82	32	103	3	32	23	1	7	38

Death-rate per 1,000, without cities of over 5,000 population, 21.33.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1883.

CAPE MAY COUNTY. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Cape May City	12	1	4	7	3	27	1,499		1	1					2	6	1		3	2		1	4			1			
Dennis	7		1	9	5	22	1,812			1						3		3	4			3	3			1			
Lower	5	2		3	10	20	1,477			1					1	2		1	1	1			4						1
Middle	5	1	4	15	15	40	2,575			1						2	4	10	3	1	4		5	1	1				3
Upper	1	3		5	11	22	1,702		1			1			2	1	2	2	2		1	1	4			2			1
Totals	30	7	9	39	44	131	9,765	13.41	2	4		1			5	14	7	16	13	4	5	5	20	1	1	4			5

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1883.

CUMBERLAND COUNTY. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bridgeton	30	6	14	35	41	135	8,722	15.46	...	11	...	...	...	...	2	12	7	13	21	9	11	1	13	...	9	1	...	1	5
Commercial	9	1	...	7	10	30	2,365	...	...	1	...	...	...	...	...	1	3	2	2	2	3	...	6	...	...	2	...	...	2
Deerfield	4	...	3	4	12	25	1,643	...	...	...	...	...	...	...	2	1	...	1	6	1	1	...	2	...	...	1	...	...	1
Downe	4	1	1	4	4	13	1,667	...	...	...	...	...	...	...	...	1	...	2	3	...	1	1	3	...	...	...	...	...	...
Fairfield	10	2	1	10	11	35	3,215	...	...	2	...	...	...	...	1	9	2	6	2	1	2	...	3	...	1	2	...	...	1
Greenwich	3	1	1	...	7	12	1,215	...	...	...	...	...	...	...	...	3	...	...	...	...	2	1	1	...	1	...	...	...	...
Hopewell	2	...	3	6	11	20	1,766	...	...	...	...	1	1	...	...	...	...	4	3	...	1	1	2	...	1	1	...	...	...
Landis	15	9	7	26	36	93	6,105	...	...	6	...	...	...	...	2	7	5	9	15	2	8	3	8	...	3	1	...	2	2
Maurice River	11	6	4	7	8	36	2,574	...	...	2	...	1	...	...	1	4	2	5	2	4	1	...	3	...	1	...	...	...	...
Millville	39	13	24	44	22	140	7,660	14.27	...	4	...	6	...	1	9	19	11	17	17	5	6	6	6	2	3	4	...	1	2
Stoe Creek	2	...	1	3	4	10	1,167	...	...	...	...	...	...	...	...	1	...	1	...	1	2	...	1	...	...	1	...	...	...
Totals	129	39	74	145	166	550	37,687	14.59	...	26	...	8	1	1	17	58	30	60	71	26	38	13	46	2	19	13	...	4	13

Death-rate per 1,000, without cities of over 5,000 population, 12.91.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1883.

ESSEX COUNTY. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Belleville	20	6	4	11	13	54	3,994	......	1	......	......	......	......	1	1	10	1	5	5	6	1	1	3	1	8	1	......	1	3
Bloomfield	20	15	5	28	34	102	5,748	......	3	1	......	1	......	1	5	9	7	7	11	6	7	5	9	......	7	6	......	5	1
Caldwell	3	3	5	5	16	37	2,167	......	1	1	......	1	......	2	4	......	2	......	3	2	6	2	6	1	2	......	......	......	......
Clinton	8	7	5	6	10	36	2,742	......	......	......	......	3	1	......	3	1	2	......	5	4	2	2	1	......	5	2	......	......	......
East Orange	30	17	15	41	23	127	8,349	......	2	2	......	4	3	......	4	11	7	11	17	10	8	6	5	......	6	6	......	2	7
Franklin	4	1	1	12	6	25	1,617	......	1	1	......	1	......	......	......	......	4	2	6	1	2	1	4	......	......	......	......	......	......
Livingston	2	......	......	1	10	13	1,101	......	......	......	......	......	......	......	......	1	......	......	1	......	2	1	2	......	2	1	......	......	......
Millburn	4	5	2	15	5	31	1,743	......	7	......	......	1	......	......	......	3	4	3	2	2	1	1	3	......	1	......	......	2	2
Montclair	20	9	5	28	16	80	5,147	......	......	1	......	......	4	3	1	9	5	7	10	4	5	3	6	......	3	4	......	1	1
Newark	830	531	308	1135	656	3,460	136,508	25.49	30	89	1	271	8	27	162	334	297	245	404	254	157	135	237	14	167	60	9	30	115
Orange	78	41	25	94	44	288	13,207	21.80	1	4	......	16	2	5	7	25	28	23	47	25	12	9	9	2	17	7	......	4	5
South Orange	12	4	3	17	8	43	2,911	......	......	2	......	......	......	......	1	7	......	7	7	......	3	2	6	......	1	......	......	......	3
West Orange	16	9	5	15	11	56	3,385	......	......	......	......	2	......	4	2	7	9	1	12	2	......	......	5	......	7	1	......	1	1
Totals	1046	648	469	1414	774	4,394	189,929	23.13	46	101	1	300	18	53	210	437	366	311	532	316	205	166	293	18	223	87	9	53	140

Death-rate per 1,000, without cities of over 5,000 population, 15.56.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1883.

GLOUCESTER COUNTY. Statistical Divisions.	DEATHS AT ALL AGES						Population census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH.																				
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.			Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation	Urinary diseases	Adult Brain and spinal diseases	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Clayton	3	6	2	6	5	22	1,981	......	......	......	......	......	......	......	......	3	1	2	5	1	1	......	2	......	2	1	......	1	2
Deptford	9	2	4	7	9	30	1,580	......	......	1	......	......	......	......	2	7	1	2	3	1	4	1	1	......	2	......	......	1	1
East Greenwich	3	......	2	10	11	26	......	......	......	1	......	......	......	......	......	2	......	4	2	1	4	......	3	......	3	1	......	......	......
Franklin	10	3	6	13	9	42	2,460	......	......	......	......	1	2	......	......	5	3	6	3	4	3	1	1	......	1	......	......	......	1
Glassboro	8	8	2	13	9	43	2,088	......	1	2	......	......	1	......	1	3	7	1	3	5	2	......	1	......	1	2	......	......	1
Greenwich	5	3	1	2	6	19	2,598	......	......	......	......	......	......	......	......	2	......	1	3	......	1	......	3	1	......	......	......	......	2
Harrison	5	5	2	13	10	37	2,811	......	......	......	......	......	1	......	3	6	1	4	6	......	3	2	6	......	2	......	......	......	......
Logan	3	2	......	7	10	22	1,765	......	1	1	......	......	......	......	1	3	......	......	1	......	2	2	2	1	1	2	......	......	2
Mantua	4	1	4	5	4	19	1,718	......	1	......	......	1	......	......	2	2	......	1	2	3	2	......	2	......	1	1	......	......	......
Monroe	6	5	1	8	8	28	1,606	......	......	......	......	......	......	......	......	3	2	4	5	1	3	1	4	......	1	1	......	......	......
South Harrison	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Washington	4	7	3	1	8	23	1,366	......	......	......	......	1	......	......	3	2	1	1	2	4	2	1	1	......	......	2	......	......	1
West Deptford	5	2	1	5	1	14	1,399	......	......	1	......	......	......	1	1	2	......	3	1	......	1	......	1	......	......	......	......	......	1
Woodbury	9	5	5	13	21	52	2,298	......	......	......	......	......	......	......	1	4	3	2	7	4	4	3	7	......	4	1	......	......	5
Woolwich	6	2	1	12	9	30	1,974	......	......	......	......	......	......	......	......	2	2	3	5	......	......	1	3	......	5	1	......	......	1
Totals	80	51	34	115	120	407	25,886	15.72	3	6	......	3	4	1	14	47	21	36	48	24	32	12	37	2	23	12	......	2	17

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1883.

HUDSON COUNTY. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption M.	Consumption F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bayonne	57	39	19	63	19	195	9,372	20.91	1	4	......	3	1	3	9	40	7	14	25	19	6	7	8	1	8	3	......	......	16
Guttenburg	13	2	2	7	2	26	1,206	......	4	1	......	1	......	......	......	4	......	1	2	4	2	......	......	......	......	1	......	......	2
Harrison	40	28	17	47	20	153	6,898	22.18	2	13	......	18	......	4	3	19	10	8	15	16	2	2	6	1	4	1	1	2	9
Hoboken	213	165	61	294	69	803	30,999	25.90	3	14	1	26	4	3	61	111	57	45	102	79	45	21	39	6	54	17	......	11	40
Jersey City	773	635	313	950	272	3,108	120,722	25.74	29	65	2	150	52	34	178	405	171	194	412	314	133	55	135	10	164	46	......	29	151
Kearny	11	5	1	16	4	40	777	......	1	2	......	2	......	......	......	5	3	1	10	1	......	1	......	......	......	1	......	1	7
North Bergen	43	41	22	83	50	237	4,268	......	2	3	1	2	3	1	4	24	34	18	34	11	6	15	25	......	8	2	......	1	10
Town of Union	56	60	37	39	17	209	5,849	35.73	6	4	......	2	4	1	52	34	14	6	30	18	8	4	7	......	4	4	......	1	3
Union	9	9	......	13	6	37	1,310	......	......	2	......	......	......	......	3	4	3	1	7	5	2	4	1	......	1	1	......	1	......
Weehawken	9	6	3	15	1	35	1,302	......	1	......	......	1	1	......	4	6	1	......	6	3	1	3	......	......	......	......	......	1	9
West Hoboken	44	17	13	50	21	152	5,415	......	7	6	......	4	3	1	6	12	9	10	27	14	11	7	5	......	4	2	......	2	1
Totals	1264	1005	456	1506	581	4,996	187,941	26.58	56	114	4	210	68	47	319	651	309	300	671	481	216	149	236	18	237	80	1	49	247

Death-rate per 1,000, without cities of over 5,000 population, 37.36.
Death-rate per 1,000, without cities of over 5,000 population, and without North Bergen township, which has the County Institutions, 29.48.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1883.

HUNTERDON COUNTY. Statistical Divisions.	DEATHS AT ALL AGES.						Population, census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH.																				
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total including undefined			Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation	Urinary diseases	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Alexandria	1	1	2	2	9	17	1,374	...	...	1	...	...	...	...	...	1	...	3	3	...	1	...	2	...	...	...	...	...	1
Bethlehem	4	2	3	7	10	26	2,820	...	...	1	...	1	...	...	...	3	2	3	2	5	3	1	2	...	...	1	...	...	1
Clinton	4	...	3	5	7	20	2,173	...	...	...	...	1	...	...	1	2	...	2	1	...	2	1	2	...	2	...	...	...	...
Delaware	6	3	3	8	21	44	3,492	...	...	1	...	...	1	...	1	5	3	1	4	4	2	1	8	...	1	2	...	...	1
East Amwell	...	...	1	8	7	17	1,696	...	...	...	...	...	...	...	...	...	1	...	3	...	2	1	3	...	...	...	...	...	1
Franklin	...	3	2	6	6	18	1,338	...	...	...	...	...	...	1	2	...	...	1	1	...	1	...	2	...	...	2	...	2	...
Frenchtown	2	9	...	7	9	26	1,039	...	1	...	...	...	...	1	...	6	1	1	3	2	2	1	3	...	4	...	...	...	...
High Bridge	4	4	4	14	8	35	2,269	...	2	...	...	1	1	...	...	1	2	3	2	3	1	2	8	1	1	1	...	2	3
Holland	6	1	1	6	15	30	1,896	...	2	1	...	...	...	...	1	3	...	...	2	...	3	3	7	1	...	...	...	1	1
Kingwood	6	3	2	4	13	29	1,694	...	...	...	...	...	...	...	...	3	2	2	3	2	3	2	3	...	2	...	...	...	...
Lambertville	8	6	7	21	16	57	4,183	...	1	2	...	3	...	...	9	6	1	7	6	1	4	2	2	...	3	1	...	1	1
Lebanon	7	8	5	5	18	43	2,699	...	...	4	...	4	1	...	4	4	...	2	7	1	2	...	1	...	...	1	1	1	3
Raritan	12	13	12	18	17	72	4,188	...	1	...	...	3	...	...	16	8	3	3	4	2	4	1	4	1	4	1	...	1	3
Readington	6	2	1	12	18	37	3,103	...	...	...	...	1	...	...	...	3	2	6	4	...	1	3	7	...	2	...	...	...	1
Tewksbury	8	5	6	5	11	34	2,108	...	...	...	...	11	...	...	...	4	1	1	5	1	2	...	3	...	1	...	...	...	...
Town of Clinton	5	...	2	2	4	13	842	...	...	...	...	...	1	...	...	...	...	1	1	...	2	...	3	...	1	...	...	...	1
Union	6	1	4	2	2	15	1,168	...	...	1	...	...	...	...	1	3	1	...	4	...	1	...	1	...	...	...	...	...	1
West Amwell	...	...	...	2	7	9	1,039	...	...	...	...	...	...	...	...	...	1	1	...	...	2	...	1	1	...	...	...	...	...
Totals	67	63	61	136	198	549	38,570	14.23	7	11	...	25	4	2	35	52	20	37	55	21	38	18	57	4	21	9	1	8	18

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1883.

MERCER COUNTY. Statistical Divisions.	DEATHS AT ALL AGES.								PRINCIPAL CAUSES OF DEATH.																				
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Chambersburg	31	16	19	27	20	119	5,437	21.88	1	7	......	......	......	......	14	16	8	4	13	9	3	4	7	......	6	1	......	......	......
East Windsor	7	2	2	16	11	39	2,271	......	......	......	......	......	......	......	1	2	2	6	5	2	7	1	2	......	......	1	......	......	1
Ewing	5	3	4	46	24	81	2,412	......	......	1	......	......	......	......	4	3	6	5	1	2	3	3	30	1	4	3	......	2	1
Hamilton	6	7	7	40	32	94	3,370	......	......	2	......	......	......	......	2	7	8	10	10	6	2	2	9	......	2	6	1	......	5
Hopewell	5	2	6	17	27	60	4,462	......	......	1	......	......	......	......	2	3	4	4	6	1	3	5	19	......	1	1	......	......	1
Lawrence	6	3	5	6	8	28	3,174	......	......	......	......	......	......	......	1	2	1	2	2	1	4	3	2	......	......	2	1	......	1
Millham	13	4	3	16	6	43	......	......	......	4	......	......	......	......	3	3	6	3	7	2	......	......	......	......	1	......	......	......	5
Princeton	17	9	7	17	25	76	4,348	......	1	1	......	......	......	......	1	17	6	3	9	4	4	4	3	......	4	1	......	......	4
Trenton	144	100	59	183	121	622	29,910	20.79	7	16	2	14	2	2	43	75	59	37	63	38	27	17	28	2	28	12	4	3	26
Washington	1	......	1	6	6	14	1,281	......	......	......	......	......	......	......	......	1	1	3	1	......	2	1	......	1	1	......	......	......	2
West Windsor	4	......	1	4	4	13	1,396	......	......	......	......	......	......	......	......	......	2	1	1	1	......	2	1	......	......	......	......	......	3
Totals	243	146	113	377	267	1,168	58,061	20.46	9	32	2	14	2	2	71	128	102	75	107	65	50	42	104	4	51	27	6	5	40

Death-rate per 1,000, without cities of over 5,000 population, 19.66.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1883.

MIDDLESEX COUNTY. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Cranbury	4	2	1	7	3	20	1,599	......	......	......	......	......	......	......	1	3	4	......	..	1	......	1	3	......	1	...	......	......	3
East Brunswick	8	6	6	15	13	50	3,272	......	......	1	......	3	......	......	3	4	4	5	3	3	2	2	4	......	3	2	......	1	1
Madison	5	2	..	7	7	21	1,662	......	......	......	......	......	......	......	......	1	3	......	2	1	1	1	2	......	1	...	......	......	3
Monroe	6	3	3	8	14	37	3,013	..	......	1	......	......	......	......	2	4	2	2	6	2	...	3	2	.	1	2	......	......	1
New Brunswick	103	85	62	119	86	460	17,166	26.79	3	7	......	23	4	6	61	55	28	32	52	20	14	25	22	2	16	11	......	1	16
North Brunswick	3	2	1	4	3	13	1,251	......	1	......	......	......	......	......	......	3	1	2	2	......	1	......	......	......	......	......	......	......	......
Perth Amboy	44	25	19	37	14	139	4,[illegible]	......	2	6	......	1	......	......	22	26	6	7	11	10	5	3	5	......	6	1	......	......	5
Piscataway	14	8	3	16	22	59	3,212	......	......	2	......	......	1	......	......	6	3	5	9	3	2	3	8	......	2	......	......	......	4
Raritan	1	6	8	22	16	56	3,780	......	......	......	......	2	......	......	4	3	1	9	9	2	5	1	6	......	1	......	......	......	8
Sayreville	1	3	3	8	1	24	1,930	......	......	1	......	1	......	......	......	5	2	2	2	3	......	......	......	......	......	1	......	......	1
South Amboy	17	9	7	19	16	69	3,648	......	1	2	......	2	......	......	4	9	4	4	8	8	6	......	6	......	1	3	......	......	3
South Brunswick	5	4	7	18	12	49	2,403	......	......	......	......	2	......	1	3	4	5	3	5	1	4	3	3	......	2	3	1	......	2
Woodbridge	21	12	4	37	19	84	4,099	......	1	1	......	1	......	3	4	12	7	8	12	7	6	1	6	......	4	3	......	......	6
Totals	232	182	123	312	226	1,085	52,286	20.75	7	21	......	34	5	10	104	137	70	79	121	61	44	43	67	2	38	25	1	2	49

Death-rate per 1,000, without cities of over 5,000 population, 17.79.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1883.

MONMOUTH COUNTY. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined	Population, census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Atlantic	7	1	......	6	6	20	1,743	......	......	1	......	......	......	......	1	1	......	1	2	1	1	......	1	......	1	......	......	......	1
Eatontown	7	6	1	20	11	45	3,642	......	......	3	......	......	......	......	......	6	6	9	......	2	4	3	4	1	3	2	......	......	1
Freehold	9	9	6	24	24	74	4,302	......	......	2	......	......	......	......	9	5	4	4	6	3	6	6	7	......	6	6	......	......	2
Holmdel	5	1	5	6	6	23	1,575	......	......	......	......	......	......	......	1	2	......	2	6	......	6	1	1	......	......	1	......	......	......
Howell	5	9	8	8	16	50	3,374	......	......	3	......	......	......	3	3	4	1	5	5	2	4	3	5	......	1	2	......	......	6
Manalapan	9	1	......	17	14	41	2,175	......	......	......	......	......	......	......	1	2	6	5	7	......	3	2	4	......	3	1	......	3	......
Marlboro	9	4	......	7	13	32	2,193	......	......	1	......	......	......	1	1	6	2	2	1	2	2	1	3	......	......	1	......	......	1
Matawan	14	5	7	25	11	62	2,699	......	1	2	......	......	......	......	7	9	5	5	7	6	3	3	4	......	2	1	......	......	1
Middletown	15	5	5	18	24	67	5,059	......	2	......	......	......	......	......	2	9	4	3	5	7	3	2	10	......	3	1	......	2	5
Millstone	3	4	5	6	6	25	2,080	......	......	2	......	......	......	......	1	2	1	1	6	1	1	2	1	......	......	......	......	......	......
Neptune	37	23	19	36	25	136	4,187	......	2	6	......	4	......	......	2	27	6	6	15	9	8	4	10	......	4	1	......	2	3
Ocean	24	17	13	36	33	133	[illegible]	[illegible]	5	......	......	9	......	......	2	14	7	6	12	6	10	2	12	1	4	3	1	1	13
Raritan	27	9	10	22	22	90	3,691	......	1	2	......	3	1	......	13	14	10	7	11	3	2	2	3	......	8	1	......	1	3
Shrewsbury	20	10	6	41	35	117	6,526	......	......	2	......	1	......	......	3	8	10	7	12	10	6	6	5	1	9	8	......	......	6
Upper Freehold	5	3	3	12	20	42	3,236	......	......	......	......	......	......	......	3	3	5	4	3	1	3	2	5	......	......	1	......	......	......
Wall	14	5	11	18	17	67	2,629	......	......	2	......	1	......	......	5	11	5	5	3	......	6	1	6	......	2	......	......	......	4
Totals	216	113	96	296	267	1,058	56,635	18.69	9	24	......	18	1	4	52	123	60	71	102	51	68	37	82	5	41	39	1	9	45

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1883.

MORRIS COUNTY. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Boonton	21	7	7	14	15	65	2,652	......	2	1	......	3	......	1	1	8	8	4	4	8	3	2	5	1	1	1	......	......	4
Chatham	9	5	6	23	29	73	4,276	......	......	......	......	1	......	......	1	5	10	5	18	1	3	1	5	1	1	4	......	......	2
Chester	16	2	3	6	8	34	2,337	......	1	......	......	......	......	......	......	5	1	1	5	4	1	......	4	......	1	......	1	......	1
Hanover	8	6	4	55	32	105	4,134	......	......	3	......	......	......	......	4	3	6	3	9	3	8	1	*12	......	4	2	......	......	3
Jefferson	4	2	5	8	10	31	1,792	......	......	1	......	1	......	......	......	......	1	1	1	8	6	1	1	......	3	1	1	1	1
Mendham	7	2	1	4	15	29	1,826	......	1	......	......	......	......	1	......	2	......	2	4	1	6	1	2	1	......	1	......	......	1
Montville	1	4	2	5	10	22	1,270	......	2	2	......	......	......	......	2	1	2	2	3	......	1	1	1	......	1	......	......	......	2
Morristown	27	34	24	51	60	196	6,837	28.96	5	2	......	2	1	......	17	16	11	15	37	13	8	5	*18	1	2	6	......	2	5
Mount Olive	6	7	5	13	7	36	1,982	......	2	......	......	1	......	......	......	1	1	5	8	4	4	1	1	1	......	......	......	1	1
Passaic	3	1	......	5	7	16	1,896	......	......	......	......	......	......	......	......	1	......	......	6	1	2	1	1	1	......	......	......	1	......
Pequannock	8	6	5	11	8	38	2,239	......	2	2	......	1	......	2	......	1	5	1	2	4	5	2	......	......	2	......	......	......	3
Randolph	41	17	15	34	23	131	7,741	......	1	1	......	6	2	......	3	11	9	5	18	9	7	4	11	......	4	......	1	1	5
Rockaway	28	17	23	20	21	112	7,366	......	4	4	......	16	......	......	1	12	2	7	22	10	7	5	5	......	2	......	1	1	4
Roxbury	9	3	8	14	9	39	2,139	......	3	1	......	3	1	......	......	1	2	3	4	1	4	1	3	......	1	......	......	......	1
Washington	10	8	4	8	17	46	2,681	......	......	3	......	4	......	......	1	3	2	4	7	8	1	5	8	......	......	1	......	......	......
Totals	176	121	107	271	271	977	50,861	19.21	23	20	......	37	4	4	30	70	60	58	143	70	66	31	102	8	22	16	4	7	33

Death-rate per 1,000, without cities of over 5,000 population, 17.69. * Morristown and Hanover township include Asylum deaths.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1883.

OCEAN COUNTY. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrhœal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Berkeley	3	......	1	6	2	12	643	......	......	......	......	......	......	1	......	......	2	2	3	1	......	......	......	......	1	......	......	......	......
Brick	3	......	4	6	13	26	2,99[illegible]	......	......	......	......	......	......	......	......	......	4	2	4	1	2	1	2	......	2	......	......	1	2
Dover	9	2	3	8	5	27	2,139	......	......	......	......	......	......	......	......	4	2	3	3	2	1	3	......	......	......	......	......	......	2
Eagleswood	4	......	1	1	1	7	592	......	......	......	......	......	......	......	......	3	......	1	......	......	......	......	1	......	......	......	......	......	......
Jackson	3	4	3	6	11	26	1,803	......	......	2	......	2	......	......	1	2	4	2	3	3	......	......	5	1	1	......	......	......	1
Lacey	2	1	1	4	5	13	814	......	......	......	......	......	......	......	2	1	......	......	4	......	......	......	......	......	1	......	......	......	......
Manchester	6	2	1	6	3	18	1,057	......	......	1	......	......	......	......	......	6	......	1	2	1	......	......	1	......	......	......	......	1	......
Ocean	3	2	......	5	2	12	464	......	......	1	......	......	......	2	......	......	1	......	3	1	1	2	......	......	......	......	......	......	......
Plumsted	6	......	2	9	6	23	1,561	......	......	......	......	1	......	......	......	2	......	2	3	1	......	1	1	......	......	1	......	1	1
Stafford	5	......	3	10	4	22	1,4[illegible]	......	......	......	1	2	......	......	......	3	4	2	1	1	1	......	4	......	1	1	......	......	......
Union	2	5	4	2	2	15	1,034	......	......	......	......	......	......	......	3	1	......	2	1	3	......	......	1	......	......	......	......	......	......
Totals	46	16	23	63	53	203	14,455	14.04	......	4	1	5	......	3	6	22	17	16	28	13	5	7	15	1	6	2	......	3	6

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1883.

PASSAIC COUNTY. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles	Whooping-cough.	Croup and diphtheria	Diarrheal diseases	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Acquackanonk	6	1	2	8	6	26	1,781	....	......	1	......	......	......	......	......	6	......	2	3	1	1	......	3	......	2	......	......	......	1
Little Falls	10	7	3	15	6	38	1,404	....	6	1	......	......	......	......	......	10	5	1	4	2	2	1	......	......	1	1	......	......	4
Manchester	1	4	1	4	5	15	1,513	....	1	1	......	1	......	......	......	3	1	2	......	1	1	......	......	......	1	......	......	......	1
Passaic	41	26	15	33	20	136	6,532	20.82	1	7	......	6	......	4	2	22	4	10	15	11	9	5	3	......	1	2	1	2	7
Paterson	416	210	143	409	225	1,415	51,031	27.73	20	31	39	35	4	18	38	224	100	90	154	132	60	42	45	1	42	25	4	11	32
Pompton	5	5	2	7	12	33	2,251	....	3	2	......	......	......	1	......	1	1	1	3	3	6	3	1	......	1	......	......	1	1
Wayne	8	1	3	6	3	21	1,747	....	1	......	......	......	......	......	1	2	1	1	1	3	1	......	......	......	1	......	......	1	2
West Milford	9	......	1	7	8	25	2,601	....	......	......	......	......	......	2	......	......	3	2	4	1	2	......	6	......	......	1	......	......	1
Totals	496	254	171	489	285	1,709	68,860	24.82	32	43	39	42	4	25	41	268	115	109	184	154	81	51	56	1	49	29	5	15	50

Death-rate per 1,000, without cities of over 5,000 population, 13.96.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1883.

SALEM COUNTY. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult Brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Elsinboro	3	2	2	1	3	10	570		1	1						3			1				1						
Lower Alloways Creek	3		3	7	2	15	1,373		1	1						1	1		1	1		1			2				3
Lower Penn's Neck	6	1	3	10	6	26	1,334		3	3							1	6	4		1	4	1	1					
Mannington	11	4	3	11	15	44	2,230			2					1	6	3	2	5		1		5		1				2
Oldmans	8	2	2	9	6	27						1	1		2	8	2	4	4	2	1		1		1	1		1	
Pilesgrove	14	6	5	15	17	59	3,497			3			1		1	6	5	3	7	2	6	1	3	1	3	1			4
Pittsgrove	4	5	5	7	14	32	1,778							1		3		4	4	4	2	2	5			3			
Quinton	6		6	6	4	24	1,390			1					2	2	2	1	3				1		1	3			
Salem	27	8	9	35	39	117	5,056	23.14	2		2			1	4	8	10	10	20	6	5	5	16		3	3		1	2
Upper Alloways Creek	6	3	1	3	8	21	1,917									4	1		4	2		1	1		2				1
Upper Penn's Neck	8	2	3	5	7	25	3,361									5	1	1	3	1	4	1	1		1			1	
Upper Pittsgrove	3	2		3	10	18	2 073		1						3	3		1	1										
Totals	97	35	40	112	127	416	24,579	16 92	7	11	2	1	3	2	12	45	25	30	56	18	19	15	35	2	15	10		3	13

Death-rate per 1,000, without cities of over 5,000 population, 15.31.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1883.

SOMERSET COUNTY. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases	Adult brain and spinal diseases.	Erysipelas.	Diarrhetive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bedminster	2	6	5	13	10	35	1,812	......	......	......	......	4	......	......	......	1	5	1	4	2	5	2	3	......	2	......	......	......	1
Bernards	6	3	1	7	9	28	2,622	......	1	2	......	......	......	......	1	5	1	2	1	..	1	......	......	......	3	2	1	......	1
Branchburg	1	2	......	5	3	11	1,316	......	......	......	......	......	1	......	......	1	......	1	1	1	1	......	1	......	......	......	......	......	2
Bridgewater	31	18	13	39	52	153	7,957	......	2	5	......	3	1	4	7	17	4	12	18	14	15	6	17	......	4	3	......	......	3
Franklin	12	7	3	18	29	69	8,818	......	3	1	......	1	2	......	......	5	6	......	13	4	5	3	6	......	2	2	......	......	5
Hillsborough	7	4	4	13	23	51	3,244	......	1	1	......	......	......	......	3	4	1	4	11	......	3	2	5	......	1	1	......	......	4
Montgomery	6	3	3	10	10	33	1,928	......	2	2	......	......	......	1	......	2	1	2	5	2	2	1	2	......	1	1	......	......	......
North Plainfield	13	5	5	14	11	48	3,217	......	......	......	......	2	1	......	2	8	4	5	6	3	1	2	3	1	2	1	......	......	......
Warren	6	5	2	3	7	21	1,204	......	2	......	......	......	......	......	2	......	......	2	4	2	1	......	3	......	1	1	......	......	......
Totals	80	53	38	122	155	449	27,162	16.53	11	11	......	10	5	5	15	41	22	29	63	31	34	16	40	1	16	11	1	......	16

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1883.

SUSSEX COUNTY. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Andover	......	1	3	7	10	21	1,150	......	1	2	......	......	......	......	3	......	......	3	1	1	1	......	6	......	......	......	......	2	......
Byram	2	4	3	5	7	21	1,406	......	......	......	......	......	......	......	2	2	......	3	4	3	1	......	2	......	3	......	......	......	......
Frankford	7	1	6	6	14	35	1,862	......	......	1	......	......	......	......	3	1	2	4	6	1	4	1	1	......	......	2	......	......	2
Greene	1	......	......	2	......	3	727	......	......	......	......	......	......	......	......	......	......	2	......	......	......	......	......	......	......	......	......	......	......
Hardyston	6	5	2	11	3	28	2,646	......	1	1	......	3	......	......	1	1	3	2	6	3	3	1	......	......	......	......	......	1	1
Hampton	1	......	......	4	4	12	895	......	......	......	......	......	......	......	......	......	1	2	......	1	......	......	......	1	......	1	......	......	1
Lafayette	......	......	1	3	2	6	761	......	......	......	......	......	......	......	......	......	......	1	......	......	......	......	2	......	......	......	......	......	......
Montague	......	......	......	2	1	3	1,032	......	......	......	......	......	......	......	......	......	......	......	1	......	......	1	......	......	1	......	......	......	......
Newton	1	5	7	14	10	39	2,513	......	......	......	......	......	......	......	9	1	5	......	1	2	5	2	4	......	......	1	......	......	......
Sandyston	1	1	3	4	5	16	1,190	......	2	1	......	......	......	......	1	1	......	1	......	......	......	3	1	1	2	......	......	......	......
Sparta	9	5	2	15	9	41	2,274	......	......	......	......	......	......	1	3	3	6	5	4	4	2	1	3	......	1	1	......	......	......
Stillwater	1	1	......	5	5	12	1,502	......	2	......	......	......	......	......	......	......	1	1	1	1	......	......	2	......	......	......	......	......	......
Vernon	3	......	2	8	8	20	1,811	......	......	......	......	......	......	......	......	1	3	3	4	2	......	1	2	1	......	......	......	......	2
Walpack	......	......	......	1	2	3	575	......	1	......	......	......	......	......	......	......	......	......	1	......	......	......	1	......	......	......	......	......	......
Wantage	6	5	4	20	20	57	3,361	......	1	4	......	2	......	......	1	6	6	4	7	......	6	1	6	......	1	......	......	......	2
Totals	38	30	32	110	100	315	22,539	13.98	8	9	......	4	......	1	23	16	26	29	36	17	22	11	30	3	7	5	......	3	8

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1883.

UNION COUNTY. Statistical Divisions.	DEATHS AT ALL AGES: Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH: Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Clark	1	1	1	3	1	7	353	......	......	......	......	......	......	......	1	......	......	2	2	......	......	......	......	......	......	......	......	......	......
Cranford	1	......	1	5	6	12	1,184	......	......	1	......	......	......	......	......	1	......	......	1	......	1	......	6	......	......	......	......	......	1
Elizabeth	166	141	91	174	111	686	28,229	24 30	11	13	......	44	1	8	31	92	43	39	76	62	40	13	23	2	22	11	......	3	33
Fanwood	4	3	1	9	7	24	1,167	......	......	2	......	......	......	......	......	2	......	1	4	2	1	1	3	......	1	......	......	......	......
Linden	7	3	3	13	7	33	1,689	......	2	1	......	......	......	......	2	5	2	2	5	2	4	......	1	......	......	......	......	1	1
New Providence	2	......	2	5	3	12	781	......	1	......	......	......	......	......	......	......	1	1	4	......	1	......	......	......	......	......	......	......	2
Plainfield	43	23	18	45	32	161	8,125	19 81	......	2	......	3	......	1	7	29	11	11	23	9	9	5	2	......	4	5	1	2	6
Rahway	23	10	15	43	38	131	6,455	20 29	3	2	......	6	......	......	2	15	10	15	16	8	6	4	10	......	2	3	......	1	4
Springfield	......	1	1	5	5	12	844	......	1	......	......	......	......	......	......	......	2	2	1	......	2	1	......	......	1	......	......	......	1
Summit	7	4	6	16	6	38	1,910	......	......	2	......	1	......	......	......	2	8	......	7	3	4	8	2	......	......	......	......	1	5
Union	4	7	3	9	12	35	2,418	......	2	2	......	2	1	......	2	......	4	1	5	2	4	1	1	......	1	......	......	......	1
Westfield	2	2	4	16	14	38	2,316	......	......	1	......	......	......	......	1	3	3	2	4	......	2	......	6	1	2	3	......	1	3
Totals	260	195	146	342	236	1,186	55,571	21 37	21	26	......	60	2	9	46	149	79	76	148	88	74	28	53	3	33	22	1	9	37

Death-rate per 1,000, without cities of over 5,000 population, 16.45.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1883.

WARREN COUNTY. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Allamuchy	......	......	......	1	1	2	648	......	......	......	......	......	......	......	......	......	1	......	......	......	......	......	......	......	......	......	......	......	1
Belvidere	4	4	4	17	6	35	1,773	......	2	......	......	4	......	......	......	3	5	2	5	1	1	2	2	......	3	......	......	1	2
Blairstown	1	4	......	6	10	22	1,468	......	......	......	......	......	......	......	2	......	......	......	2	2	3	2	2	......	2	......	......	......	1
Franklin	4	1	1	6	7	19	1,529	......	......	......	......	......	......	......	......	3	1	1	1	......	3	......	3	......	......	1	......	......	1
Frelinghuysen	......	......	3	3	2	8	1,042	......	......	......	......	1	......	......	1	......	1	1	2	......	1	1	......	......	......	......	......	......	......
Greenwich	2	1	1	7	6	18	2,354	......	......	......	......	1	......	......	......	1	......	2	4	1	......	1	2	......	2	1	......	......	1
Hackettstown	10	5	2	15	15	45	2,502	......	......	2	......	......	2	......	1	1	......	5	4	3	3	......	5	......	1	1	......	......	4
Hardwick	2	......	......	2	1	5	583	......	......	......	......	......	......	......	......	......	1	1	......	......	1	......	......	......	......	......	......	......	......
Harmony	3	2	1	4	4	14	1,350	......	......	1	......	......	......	......	1	......	......	......	3	1	......	1	......	......	......	......	......	......	......
Hope	8	5	1	8	6	28	1,569	......	......	......	......	......	1	......	......	3	1	3	3	5	1	1	1	......	......	1	......	1	2
Independence	1	1	-	7	3	13	1,018	......	......	......	......	......	......	......	......	1	......	1	......	1	1	1	1	1	......	1	......	......	2
Knowlton	2	1	2	3	8	17	1,476	......	......	......	......	2	1	......	1	......	2	1	......	......	1	......	2	......	1	......	......	......	1
Lopatcong	5	1	6	4	7	23	1,591	......	2	1	......	2	......	......	......	5	1	......	4	......	......	......	3	......	......	......	......	......	......
Mansfield	4	......	3	8	12	27	1,769	......	......	1	......	1	1	......	......	1	2	6	4	3	2	......	3	......	1	1	......	......	1
Oxford	17	16	10	19	16	81	4,591	......	2	2	......	3	......	......	......	4	5	3	24	5	6	1	3	......	2	......	......	......	5
Pahaquarry	......	......	......	1	2	3	418	......	......	......	......	......	......	......	......	......	......	......	1	......	......	1	......	......	......	......	......	......	......
Phillipsburg	39	34	9	34	31	147	7,181	20 46	1	3	......	6	2	......	21	17	7	7	11	9	3	1	13	......	3	1	......	1	6
Pohatcong	5	3	......	11	3	20	......	......	......	......	......	1	......	......	......	3	......	2	2	1	2	1	2	......	......	1	......	......	2
Town of Washington	4	2	6	5	6	26	2,142	......	......	......	......	2	......	......	2	3	1	1	1	3	......	2	3	......	1	......	......	......	1
Washington	9	3	6	12	7	25	1,452	......	......	1	......	4	......	......	......	4	2	1	3	2	1	2	4	......	......	......	......	1	5
Totals	119	84	55	176	147	591	36,589	15 15	7	11	......	27	7	......	29	49	25	37	74	39	28	17	50	1	17	8	......	4	30

Death-rate per 1,000, without cities of over 5,000 population, 15.09.

COMMENTS ON SPECIAL DISEASES.

While the returns, both of marriages and births, for the last year show an increase over those of the previous years, there is a considerable decrease of the number of deaths from the record of the former year, which was one of an exceptional amount of serious diseases. We confine this article to Comments on Special Diseases.

Remittent Fever. The comparison of this year with the former year, of city with country, furnishes some important evidence as to remittent fever. It is, first of all, to be borne in mind, that no other death record represents so large an aggregate of sickness, in proportion to the number of deaths, as does this fever. It stands for hundreds of cases of it that recover—for thousands often of the milder cases of intermittent fever, and of chills and fever, as well as for many neuralgic maladies, and a general malaisé traceable to the same cause. As one reads and compares these statistics with local reports, it is constantly evident that the disease is not a freak of nature, but the result of abnormal decay, chiefly of vegetable matter in undrained lands and immediate favoring circumstances of stagnation and heat. The summaries of local reports shows many instances in which great improvement has followed proper drainage, and many more where the need thereof is fully realized. We have some effective drainage laws upon our statute book, and there is great need that the life-saving advantage of thorough drainage be more fully realized. Important discussions, which have taken place the past year, not only confirm former views as to the relation of marshy or paludal localities to these periodic fevers, but also give prominence to two other views, viz., that in such districts the drinking-water often becomes the vehicle of the exciting cause; and, next, that the condition of warmth in which new cellars and the close ground vicinage of houses is often kept gives us such local conditions as correspond to summer

heat, moisture and decomposition, and so are making winter chills and winter remittents more common.

Typhoid Fever. While information of local outbreaks of typhoid fever of large extent have not reached us the last year, local and circumscribed outbreaks, clearly traceable to local causes, occurred in Beverly, Trenton, Bridgeton, Chambersburg, Paterson, Passaic, Camden, Asbury Park and Ocean Grove. But the noticeable fact is that the disease is quite diffused throughout the State, almost every county and nearly all of the cities showing many cases.

It is so certainly a result either of bad sewage or fecal accumulations, or else of the direct conveyance of the poison from the secretions of those who have had the disease, that it is not to be looked upon as a result of any general cause, but as a fatal fever directly resulting from insanitary conditions. The cases late in the season, at Asbury Park, occurred in the very houses long before complained of, and before there was active response to the orders of the local Board of Health. The steady increase of this disease in the State is certain unless the greatest vigilance is used by local Boards of Health in promoting and securing the best conditions for the removal of animal secretions and decomposing animal matters from around human habitation. Added to this must be the most accurate precautions as to the disposal of all secretions, clothing, etc., about the sick, lest these, through drinking-water or other vehicles, shall carry the poison to those who are healthy and in healthy homes.

Small-pox. We have reason to rejoice in a great decrease of death-rate from this cause. It will not be sustained unless the increased attention given the last two years to vaccination is kept alive. School Boards, parents and Boards of Health must not neglect this matter. Full details are presented in the valuable articles on this subject, in the last report and in the two small-pox circulars of the Board. We have had some most satisfactory instances of the intelligent supervision and promptness of local Boards by which single cases have been prevented from starting an epidemic.

Scarlet Fever continues to be the great dread of mothers and the destroyer of very many valuable lives, especially between the ages of five and twelve. In a single township (Tewksbury, Hunterdon county), 150 cases and about 20 deaths are reported. The restriction which

has been made as to this disease is manifest where physicians and friends are on the alert early, with methods of isolation, disinfection and a proper care that the peeling off of the scarf skin is either prevented from mingling with the air, by oiling, or quickly disposed of by frequent bodily washings. The remarks as to it, in the last report, can be borne in mind without repetition here.

Measles. This is one of the diseases so communicable that comparatively few escape it. Its fatality during our civil war and sporadic instances of severe local epidemics show that in favoring climatic conditions and amid unfavorable circumstances of care and nursing, it may become a rapidly destructive disease. Still oftener does it cause such impairment of lung tissue as manifests itself in early manhood or womanhood, with symptoms of pulmonary disease. While the same strict rules of isolation and of prohibition from public schools as are applied to scarlet fever and some other contagious diseases, are not often enforced as to it, yet the type should be carefully noted and all cases receive careful attention at the outset. It has prevailed very extensively in many parts of the State, but not with a large proportionate mortality.

Rötheln. This is a disease so similar to measles as often to be known as German measles, and scarcely distinguishable in eruption from the other.

Two circumscribed epidemics of it were the past year recorded in the State, the one in Chester township, Burlington county, and the other at Atlantic City. One death is reported. As a rule, it is only of interest because its diagnosis from measles is so difficult.

Whooping Cough. We noticed in the last report, that for three years in succession, this had registered a higher mortality than measles. This year we have from it 189 deaths. It is a disease from which recovery would be almost universally the rule if its spasmodic symptoms were at once met by appropriate treatment. The carelessness of parents, or too much reliance on domestic remedies, is the more usual cause of the fatality. In order to prevent the spread of the disease, the sputa should not be received upon handkerchiefs to be carried in the pocket, but into some forms of disinfectant fluid. Changes of temperature must be carefully guarded, as it so easily passes into a suffocative catarrh, or causes bronchial disease.

Influenza, or a form of catarrhal fever, records a very few deaths in the State. But associate evidence from reports, and from medical practitioners, show that it prevailed very extensively in the State last winter and spring. It was especially prevalent in Atlantic, Burlington, Camden, Cumberland, Mercer, Hunterdon and Morris counties. In Middle Valley, Morris county, it affected nearly the whole population; and, in general, through the parts of the State affected, showed a progress, an extent, and a universality that easily identified it as being of the climatological form of that disease which, under various names, has traveled over States and continents, and subjected multitudes to its influence. It is especially worthy of note as interfering with labor, as sometimes affecting all mucous membranes, and as to be mitigated and even sometimes prevented by remaining indoors until the influence has passed by. So far as known it does not, like many of the zymotic diseases, depend much on local conditions. Yet, as the very young or the old frequently succumb to it, it needs much earlier attention than is usually given to catarrhs.

Croup and Diphtheria. We had occasion in the last report to trace an increase from 1873, in 1879–80, to 1,728, in 1880–81, and to 1,472, in 1881–82. The record for the year is 1,146. In the Town of Union, Hudson county, in a population of 5,849, it caused this year 52 deaths, and the year before 47.

While a majority of the cases occur in the city, it is also a disease very common in rural districts. Unlike small-pox, or measles, or scarlet fever, it seems to arise without antecedent cases from favoring local conditions. It is now believed that it is sometimes conveyed by water and by milk kept in improper milk cellars. Stagnant dampness in confined places and some forms of vegetable decay have in many cases been closely associated with it. Parents are becoming better informed as to the need of early medical advice, and as to the necessity of constant dilution of the impure air in rooms where children are sick therefrom. It is chiefly in confined localities that it takes on a virulent form.

Diarrheal Diseases. The connection of these with wrong food, bad air, impure water and poor milk is fully certified.

Young children that are allowed, in summer, to eat of all table dishes and of various kinds of fruit and confectionery at unseasonable times, are frequently its victims. In cities it is often desirable to use

water that has first been boiled and then poured from one pitcher to another for aeration, and made moderately cool with ice. In the country, wells are apt to become low in summer, and the quality of the water is such as to need similar treatment. Our last report contained a valuable paper on the various forms of artificial food. Some of these are valuable, but others directly injurious to young children. It is often, too, the case that children are overfed, and so an irritable condition of the mucous membrane is produced. The necessity of second summer sickness is taken entirely too much for granted. Where the transition from milk diet is to plain, well-cooked food in moderate supply, we rarely find this effort of nature to rid itself of unwholesome foods or drinks.

Consumption and Acute Lung Diseases. The study of pulmonary diseases can never diminish in importance so long as many thousands die each year therefrom. It is easy to see from our records the effects of such occupations as those of the potter, the hatter, etc. Also, that most of the dust trades and occupations count many victims. Nor is it surprising that many die therefrom in the open country, and especially females. Indoors work in damp houses, or the steam of the laundry and the kitchen, and the chill of the cellar, too often give sudden alternations of temperature. In many of our farm houses there is need of consulting more closely the health of those who labor indoors, and of providing the best and easiest methods of work. We look with much expectation to the diminution of this disease in the State, because the advantages of change of climate within our own borders are coming to be understood.

Brain and Nervous Diseases. These, both in the young and adult life, cause a great mortality. But there is a marked contrast between the brain and nervous diseases of adults and those of children. With adults, many result from excessive toil, and from an overstrain of the heart and circulatory system. With children, bad modes of sleeping, exposure to great heat, and especially the direct rays of the sun, and irritation of the stomach and bowels often are declared in this way. Forced study, or worry over books, is sometimes a cause. The little nervous ailments of children are too often overlooked. Many a convulsion is followed by no subsequent treatment. A single attack, or a few attacks, can often be prevented from becoming habitual or resulting in epilepsy or idiocy, when it is afterward difficult or impos-

sible to interrupt the tendency. Many cases, functional at first, thus become organic and incurable, and add to our dependent and afflicted population. There is great need that physicians be more impressed with the necessity of attending to children after a convulsion, and of cautioning the parents not to allow repetitions to take place, but to keep the child under medical supervision and treatment.

Diseases of the Heart and Circulation are not only common in old age or with those exposed through life to great business excitements, but occur also in the young, or as a result of such exposures as induce rheumatism. By early and active treatment, and by the use of salicylic acid and alkalies, many cases of rheumatism are prevented from seizing upon the valvular structure of the heart. It is a fact that heart diseases are prevented or ameliorated by care and hygienic conditions more than formerly, and thus many lives are prolonged.

Urinary Diseases. These, while grouped together, are distinguished in office tables. A large proportion of them are such as affect the kidney as a secreting and separating organ. Alcohol, the use of sharp condiments and other errors of alimentation and digestion, record their effects upon this excretory apparatus. Disease attacks its structure with comparative rareness, unless it has been subjected to very unfavorable conditions.

Adult Brain and Spinal Diseases seem to be on the increase. Whenever the nervous system is subjected to early irregularities or is overtaxed in middle life, it is apt to show itself in an early embarrassment of some part of this intricate structure. The number of imperfect or shortened lives past middle life are thus multiplied and much power abstracted from the years which would otherwise give both comfort and vigor for labor.

Erysipelas is becoming more and more an important study. Many facts seem to classify it as a specific disease of a zymotic character and to show that it frequently takes on the virulence of an infectious disease. There are so many evidences that it is inoculable and is apparently carried by contagion that great care is to be exercised as to it.

Its undoubted relation as a conveyor or excitant to puerperal fever makes it very certain that the medical practitioner or the nurse may

not pass from cases of this disease to those in child-bed, without the most precise and cleanly precautions. Since so much of this attendance is rendered by women, they need to know how precious lives are endangered unless all precautions are taken.

Puerperal conditions and diseases need the most careful guard. The loss of mothers, and especially if dependent children are left, means more to the State than is generally supposed. It is for this reason that some governments provide maternities, in order that the risks of loss may be diminished and that the poorer classes may be assured of skilled attendance.

Cancer, as a disease, seems on the increase. The returns for this year show 461 cases. While certain organs are especially prone to this degeneration, it is probable that some small and benign tumors or some forms of localized skin fissures and irritations are forced into a malignant type. The disease is being made more and more a subject of close investigation, and it is to be hoped that preventive care will accomplish more than has yet been accomplished by medicinal means.

Accidents. The constant increase of *accidents* should attract public attention. Drowning, accidents by fire-arms, by railroads and by machinery are more often the result of carelessness than of some unavoidable catastrophe.

There should be laws of prohibition as to bathing and fire-arms, applicable to minors. Machinery in factories should be more fully protected and strict inquiries be made into all other forms of accident. This very watchfulness is a great preventive.

The space at command has required brevity in this summary, but as the record of this year will form a part of the quinquennial record just tabulated, to be more fully analyzed in the next report, there is not so much need of details here. As the tables advance in number of years and in completeness, they lead us to important facts as to localities and greatly aid in the estimates of methods for the promotion of public and private hygiene. This means better and stronger lives, which add alike to the comfort of the citizens and the capital of the State.

OUINQUENNIAL TABLES.

Statement of Marriages, Births and Deaths, including all Supplements, for the five years ending June 30th, 1883.

Cities of over 5,000 Population not included in the Counties.	M.	B.	D.	Population 1880.	Death-rate.
Atlantic County	457	1,404	1,122	13,227	16 96
Atlantic City	200	494	611	5,477	‡22.31
Bergen County	964	3,447	3,044	36,786	16.55
Burlington County	1,356	4,306	3,292	42,832	15.37
Bordentown	236	623	444	5,334	16.65
Burlington City	284	675	692	7,237	19.12
Camden County	433	1,686	1,598	15,986	20.06
Camden City	2,057	3,690	4,391	41,659	21.08
Gloucester City	184	695	481	5,347	17.99
Cape May County	366	1,076	657	9,766	13.46
Cumberland County	742	1,996	1,567	21,306	14.71
Bridgeton	516	1,106	778	8,722	17.84
Millville	407	1,173	760	7,660	19.84
Essex County	1,029	4,180	2,963	40,214	14.74
Newark	6,194	18,931	16,061	136,508	23.52
Orange	542	2,103	1,393	13,207	19.58
Gloucester County	869	3,146	2,066	25,886	15.96
Hudson County	336	1,519	2,317	14,104	§32.86
Bayonne	273	1,165	896	9,372	19.15
Harrison	142	687	698	6,898	20.24
Hoboken	1,468	4,283	3,980	30,999	25.68
Jersey City	4,532	8,497	14,647	120,722	24.27
Town of Union	324	801	780	5,849	26.98
Hunterdon County	1,300	3,668	2,662	38,570	13.80
Mercer County	625	1,947	1,980	22,714	17.43
Chambersburg	176	665	554	5,437	20.38
Trenton	1,607	2,963	3,043	29,910	20.35
Middlesex County	1,019	3,514	2.830	35,120	16.12
New Brunswick	697	2,183	1,778	17,166	20.71
Monmouth County	2,376	5,840	4,793	55,538	17.26
Morris County	1,364	4,427	3,737	44,024	16.98
Morristown	212	604	657	6,837	19.22
Ocean County	478	1,611	1,010	14,455	13.97
Passaic County	401	913	822	11,297	14.55
Passaic City	298	1,089	670	6,532	20.51
Paterson	2,491	7,145	6,206	51,031	24.32
Salem County	573	1,960	1,503	19,523	15.40
Salem City	237	494	485	5,056	19.18
Somerset County	835	2,356	2,141	27,162	15.76
Sussex County	885	1,533	1,732	23,539	14.72
Union County	260	1,155	1,039	12,762	16.28
Elizabeth	1,062	3,789	2,773	28,229	19.65
Plainfield	261	856	663	8,125	16.32
Rahway	288	577	704	6,455	21.81
Warren County	1,092	3,197	2,343	29,408	15.93
Phillipsburg	329	1,164	653	7,181	18.19
Totals	42,698	*121,406	†109,906	1,131,117	19.43

* In the Birth Record, all Cities which have increased to 5,000 population, are still with their Counties, as originally recorded.

† Total additional Still Births for five years, 7,195. ‡ See note, page 349. § See note, page 357.

Total Averages for the State for five years—Persons married to 1,000 persons living, 15.10; persons born to 1,000 persons living, 21.47; persons deceased to 1,000 persons living, 19.43.

Summary of Vital Facts as to Occupations, from New Jersey Marriage Record, for Five Years ending June 30th, 1883.

NOTE.—These Tables include the Marriages for Five Years, as to which the Facts here Recorded are Given.

	Cultivator of ground.	Water employs.	Railroad employs.	Laborer.	Baker.	Barber.	Blacksmith.	Brewer.	Brick layer.	Butcher.	Cabinetmaker.	Carpenter and Joiner.	Carmaker.	Cigarmaker.
Atlantic County	84	92	17	81	2	2	5	2	......	6	3	27	......	5
*Atlantic City	12	8	11	16	2	3	2	......	......	......	3	15	......	......
Bergen County	217	11	26	134	6	8	18	......	......	12	1	38	3	4
Burlington County	551	56	24	203	10	11	19	......	4	16	2	38	6	1
Bordentown	56	12	13	26	2	1	3	......	1	2	1	7	2	3
Burlington City	69	1	11	31	3	2	3	......	5	3	......	5	3	1
Camden County	201	6	11	43	3	......	7	1	......	2	1	12	......	......
Camden City	176	97	95	200	17	21	37	2	11	20	7	66	10	16
Gloucester City	12	5	5	47	2	3	3	......	3	1	......	7	......	2
Cape May County	90	76	6	35	4	......	4	......	1	3	......	19	......	19
Cumberland County	268	125	9	62	......	3	18	1	2	4	2	14	1	......
Bridgeton	119	32	9	70	4	5	4	......	......	4	......	7	3	3
Millville	34	47	7	42	2	4	11	......	......	3	......	6	......	4
Essex County	100		38	90	7	3	15	2	......	16	2	63	3	4
Newark	159	32	164	394	111	75	80	84	7	140	20	218	14	75
Orange	22	1	16	58	1	4	4	......	......	7	1	22	1	4
Gloucester County	319	10	14	84	2	6	16	......	......	8	2	28	3	3
Hudson County	16			34	11	5	4	3	3	7	1	14	1	4
Bayonne	5	12	11		1	......	......	......	......	2	......	8	......	1
†Harrison	1		3		1	1	......	......	1	2	......	2	1	1
Hoboken	34	73	71	152	26	18	11	6	2	43	15	34	3	30
Jersey City	103	152	261	496	42	37	38	7	5	80	17	145	6	41
‡Town of Union	5			15	5	5	4	8	......	6	3	1	6	5
Hunterdon County	664		53	106	3	7	36	......	1	4	3	37	2	2
Mercer County	281		17	69	7	1	6	......	1	8	2	16	6	3
§Chambersburg	4		1	12	3	......	......	......	......	......	1	5	1	......
Trenton	141		45	306	26	23	28	3	4	24	3	38	3	10
Middlesex County	242	51	54	184	6	5	19	1	1	18	......	61	2	2
New Brunswick	69	37	25	129	7	2	3	......	......	16	......	26	......	1
Monmouth County	748	137	68	270	14	9	37	1	......	25	2	100	9	4
Morris County	319	11	78	141	4	4	48	......	......	16	1	34	6	2
Morristown	36	......	7	24	3	......	6	......	1	1	......	12	3	......
Ocean County	150	67	13	76	1	1	6	......	......	2	......	26	......	1
Passaic County	122	......	10	50	5	1	12	......	......	4	......	19	1	......
‖Passaic City	10	......	5	52	......	......	5	1	......	6	......	6	6	3
Paterson	86	10	50	312	25	24	63	7	10	48	5	102	8	10
Salem County	392	24	6	67	9	3	8	......	3	13	......	13	......	1
¶Salem City	51	1	2	10	......	......	1	......	1	2	......	3	1	3
Somerset County	311	4	28	101	3	7	15	......	......	15	2	27	3	4
Sussex County	372	5	49	96	3	4	16	......	2	10	1	39	1	......
Union County	51	......	10	21	......	......	1	......	......	3	1	9	......	1
Elizabeth	36	37	47	169	8	6	16	......	......	17	6	42	......	3
Plainfield	18	......	7	22	2	1	8	......	......	8	......	16	......	......
Rahway	24	1	12	25	2	3	4	......	......	2	1	14	6	2
Warren County	424	11	52	112	3	6	25	......	......	14	4	38	6	3
Phillipsburg	46	5	60	67	1	2	3	......	......	1	1	9	1	2

* Atlantic City, included with county for years 1878–79 and 1879–80.
† Harrison, included with county for years 1879–80.
‡ Town of Union, included with county for years 1879–80.
§ Chambersburg, included with county for years 1878–79, 1879–80 and 1880–81.
‖ Passaic, included with county for years 1878–79 and 1879–80.
¶ Salem, included with county for years 1878–79.

Summary of Vital Facts as to Occupations, from New Jersey Marriage Record, for Five Years ending June 30th, 1883.—Continued.

Note.—These Tables include the Marriages for Five Years, as to which the Facts here Recorded are Given.

	Clergyman.	Clerk and bookkeeper.	Cooper.	Dentist.	Druggist.	Editor.	Furnaceman.	Glassmaker.	Grocer.	Harnessmaker.	Hatter.	Innkeeper.	Jeweler.	Lawyer.
Atlantic County	......	10	1	......	3	1	......	16	6	......	......	2	......	......
*Atlantic City	......	4	2	......	......	......	......	2	2	1	......	5	1	1
Bergen County	1	67	......	......	1	3	......	1	9	1	2	9	5	11
Burlington County	6	37	......	1	5	2	......	1	8	2	......	6	1	4
Bordentown	1	10	......	......	2	......	......	1	......	1	......	......	1	2
Burlington City	2	8	1	1	1	1	......	......	2	1	......	2	1	......
Camden County	3	17	......	......	......	......	1	12	1	......	2	......	......	2
Camden City	10	179	4	4	15	5	......	18	24	7	11	21	6	14
Gloucester City	......	8	1	......	1	......	......	......	......	......	......	9	......	1
Cape May County	5	16	......	......	......	......	......	3	2	......	......	2	1	......
Cumberland County	6	23	......	1	4	2	......	17	1	1	......	1	......	1
Bridgeton	1	25	2	1	3	......	......	59	4	2	......	......	1	3
Millville	1	15	......	1	1	......	......	113	1	......	......	......	......	2
Essex County	6	104	......	5	9	4	......	1	15	3	71	7	11	15
Newark	17	506	19	12	36	4	......	4	73	66	295	65	215	25
Orange	1	31	......	3	2	1	......	......	6	......	184	4	......	6
Gloucester County	5	29	2	1	5	......	......	76	7	5	......	2	4	1
Hudson County	1	33	2	1	......	1	1	2	2	......	......	2	......	......
Bayonne	1	20	9	3	......	......	......	......	2	1	......	1	1	2
†Harrison	......	2	......	......	......	......	......	......	1	1	......	1	2	......
Hoboken	......	178	11	2	5	3	......	1	26	1	2	25	16	8
Jersey City	9	554	15	8	24	5	......	1	62	7	6	49	41	39
‡Town of Union	......	11	3	......	5	......	......	......	5	......	......	2	1	......
Hunterdon County	4	4	......	1	5	1	......	......	2	4	1	3	4	13
Mercer County	7	37	......	......	5	......	......	......	3	......	1	6	2	5
§Chambersburg	......	3	......	......	......	......	......	......	1	......	......	1	......	......
Trenton	5	106	6	7	7	......	......	......	14	2	1	17	7	13
Middlesex County	7	59	1	1	4	1	......	1	5	1	3	5	2	4
New Brunswick	9	46	1	......	4	......	......	1	6	2	3	4	3	6
Monmouth County	15	135	2	5	4	3	......	......	16	14	4	8	4	19
Morris County	12	41	......	2	7	2	3	......	5	3	5	2	5	4
Morristown	2	17	......	2	5	......	......	......	3	......	......	......	1	4
Ocean County	4	19	......	......	2	......	......	......	......	2	1	2	1	1
Passaic County	1	20	1	......	......	......	......	......	2	......	2	3	......	1
‖Passaic City	......	29	......	......	1	1	......	......	4	......	......	1	......	1
Paterson	2	118	3	1	5	2	......	1	25	3	2	12	2	18
Salem County	3	12	......	......	......	......	......	14	1	2	......	3	......	......
¶Salem City	1	5	......	......	......	......	......	15	......	......	......	......	......	1
Somerset County	13	41	......	1	5	......	......	......	10	1	1	6	1	8
Sussex County	8	33	......	4	2	2	3	1	2	1	......	7	1	4
Union County	1	38	......	......	2	......	......	......	4	......	13	3	2	1
Elizabeth	2	111	1	2	9	2	......	......	15	4	5	4	7	10
Plainfield	1	33	......	......	2	......	......	......	4	1	4	......	1	2
Rahway	......	36	......	1	2	1	......	......	5	2	......	3	4	2
Warren County	10	40	3	1	6	......	......	......	1	2	1	2	......	11
Phillipsburg	......	16	......	......	3	......	1	......	2	......	......	2	1	2

* Atlantic City, included with county for years 1878–79 and 1879–80.
† Harrison, included with county for years 1879–80.
‡ Town of Union, included with county for years 1879–80.
§ Chambersburg, included with county for years 1878–79, 1879–80 and 1880–81.
‖ Passaic, included with county for years 1878–79 and 1879–80.
¶ Salem, included with county for years 1878–79.

Summary of Vital Facts as to Occupations, from New Jersey Marriage Record, for Five Years ending June 30th, 1883.

NOTE.—These Tables include the Marriages for Five Years, as to which the Facts here Recorded are Given.

	Cultivator of ground.	Water employe.	Railroad employe.	Laborer.	Baker.	Barber.	Blacksmith.	Brewer.	Brick layer.	Butcher.	Cabinetmaker.	Carpenter and Joiner.	Carmaker.	Cigarmaker.
Atlantic County	84	92	17	81				2	......	5	3	27	......	4
*Atlantic City	12	8	1	16				......	......	......	2	15	......	......
Bergen County	217	11	26	134			15	......	......	12	1	36	3	4
Burlington County	531	56	25	202	10	11	19	......	4	16	2	35	6	1
Bordentown	56	12	13	36		1		......	1	2	1	7	2	3
Burlington City	69	1	11	31				......	5	3	......	6	3	1
Camden County	201	6	11	43	3	......	7	1	......	2	1	13	......	......
Camden City	176	97	95	200	17	21	37	2	11	20	7	56	10	16
Gloucester City	12	5	6	47				......	3	1	......	7	......	2
Cape May County	90	76	6	35				......	1	3	......	19	......	19
Cumberland County	268	125	9	62			16	1	2	4	2	14	1	......
Bridgeton	119	32	9	70				......	......	4	......	7	3	3
Millville	84	42	7	42			11	......	......	3	......	6	......	4
Essex County	100	3	38	90	7	3	15	2	......	15	2	63	3	6
Newark	159	32	164	364	111	75	80	84	7	140	24	218	16	75
Orange	22	1	16	58	1			......	......	7	1	22	1	4
Gloucester County	319	10	14	84	2		16	......	......	6	2	38	2	3
Hudson County	18	5	8	34	11			2	3	7	1	14	1	6
Bayonne	5	12	11	81	1			......	......	2	......	6	......	1
†Harrison	1	......	3		1	1	......	......	1	2	......	2	1	1
Hoboken	24	73	71	152	26	13	11	6	2	43	15	34	2	30
Jersey City	103	152	281	486	42	37	38	7	5	90	17	145	6	41
‡Town of Union	5	3	6	15	5			6	......	6	2	1	4	5
Hunterdon County	664	3	53	106			26	......	1	4	3	37	7	2
Mercer County	281		17	89		4		......	1	6	3	18	4	3
§Chambersburg	4	......	1	22	3	......	......	......	......	......	1	5	1	......
Trenton	141	4	45	206	26	23	28	2	6	24	3	38	3	10
Middlesex County	242	51	54	184		5	19	1	1	16	......	61	2	2
New Brunswick	69	37	25	129		2		......	......	16	......	25	......	1
Monmouth County	748	137	68	270	14	9	37	1	......	25	2	105	9	4
Morris County	319	11	78	141		4	46	......	......	16	1	35	4	2
Morristown	36	......	7	21		......		......	1	1	......	12	2	......
Ocean County	150	67	13	76		1	6	......	......	2	......	26	......	1
Passaic County	122	......	10	80		1	12	......	......	4	......	19	1	......
‖Passaic City	10	......	5	52		......		1	......	6	......	6	4	3
Paterson	86	10	50	312	23	24	63	7	10	48	5	102	3	10
Salem County	392	24	6	67		2	8	......	5	13	......	13	......	1
¶Salem City	51	1	2	16		......	1	......	1	2	......	3	1	3
Somerset County	311	4	28	101		7	15	......	......	15	3	29	3	6
Sussex County	372	5	49	98		4	16	......	2	10	1	39	1	......
Union County	51	......	10	31		......	1	......	......	3	1	9	......	1
Elizabeth	36	37	47	169		6	16	......	......	17	5	42	......	3
Plainfield	18	......	7	22		1	5	......	......	6	......	16	......	......
Rahway	21	1	12	25		3	4	......	......	2	1	16	6	2
Warren County	424	11	52	112	3	5	25	......	......	14	4	24	9	3
Phillipsburg	46	5	60	67	1	2	3	......	......	1	1	9	......	2

* Atlantic City, included with county for years 1878–79 and 1879–80.
† Harrison, included with county for years 1879–80.
‡ Town of Union, included with county for years 1879–80.
§ Chambersburg, included with county for years 1878–79, 1879–80 and 1880–81.
‖ Passaic, included with county for years 1878–79 and 1879–80.
¶ Salem, included with county for years 1878–79.

Summary of Vital Facts as to Occupations, from New Jersey Marriage Record, for Five Years ending June 30th, 1883.—Continued.

Note.—These Tables include the Marriages for Five Years, as to which the Facts here Recorded are Given.

	Clergyman.	Clerk and bookkeeper.	Cooper.	Dentist.	Druggist.	Editor.	Furnaceman.	Glassmaker.	Grocer.	Harnessmaker.	Hatter.	Innkeeper.	Jeweler.	Lawyer.
Atlantic County	......	10	1	......	3	1	......	14	6	......	......	2	......	......
*Atlantic City	......	4	2	......	......	......	......	2	2	1	......	5	1	1
Bergen County	1	87	......	......	1	3	......	1	9	1	2	9	5	11
Burlington County	6	37	......	1	3	2	......	1	2	2	......	6	1	4
Bordentown	1	10	......	......	2	......	......	1	......	1	......	......	1	3
Burlington City	2	8	1	1	1	1	......	......	2	1	......	2	1	......
Camden County	3	17	......	......	......	......	1	12	1	......	2	......	......	2
Camden City	10	179	4	4	15	6	......	18	24	7	11	21	6	14
Gloucester City	......	8	1	......	1	......	......	......	......	......	......	3	......	1
Cape May County	5	16	......	......	......	......	......	3	1	......	......	2	1	......
Cumberland County	6	23	......	1	4	2	......	17	1	1	......	1	......	5
Bridgeton	1	23	2	1	3	......	......	69	4	2	......	......	1	2
Millville	1	15	......	1	1	......	......	113	1	......	......	......	......	2
Essex County	6	106	......	5	9	4	......	1	15	3	71	7	11	16
Newark	17	506	19	12	35	4	......	4	73	66	295	65	215	26
Orange	1	31	......	3	2	1	......	......	6	......	184	4	......	8
Gloucester County	5	29	2	1	5	......	......	76	7	5	......	2	4	1
Hudson County	1	33	2	1	......	1	1	2	2	......	......	2	......	......
Bayonne	1	20	9	3	......	......	......	......	2	1	......	1	1	2
†Harrison	......	2	......	......	......	......	......	......	1	1	......	1	2	......
Hoboken	......	178	11	2	5	3	......	1	26	1	2	25	16	8
Jersey City	9	554	15	5	24	5	......	1	62	7	6	49	41	39
‡Town of Union	......	11	3	......	3	......	......	......	5	......	......	2	1	......
Hunterdon County	4	4	......	1	5	1	......	......	2	6	1	2	4	13
Mercer County	7	37	......	......	5	......	......	......	3	......	1	6	2	7
§Chambersburg	......	3	......	......	......	......	......	......	1	......	......	1	......	......
Trenton	5	106	6	7	7	......	......	......	14	2	1	17	7	13
Middlesex County	7	59	1	1	6	1	......	1	5	1	5	5	2	4
New Brunswick	9	46	1	......	4	......	......	1	6	2	3	4	3	6
Monmouth County	15	131	2	5	8	3	......	......	16	14	4	8	4	19
Morris County	12	41	......	2	7	2	3	......	5	3	5	2	5	4
Morristown	2	17	......	2	5	......	......	......	3	......	......	......	1	4
Ocean County	4	19	......	......	2	......	......	......	......	3	1	2	1	7
Passaic County	1	20	1	......	......	......	......	......	2	......	2	3	......	1
‖Passaic City	......	29	......	......	1	1	......	......	4	......	......	1	......	1
Paterson	2	118	3	1	6	2	......	1	25	3	2	12	2	10
Salem County	3	12	......	......	......	......	......	14	1	2	......	2	......	......
¶Salem City	1	6	......	......	......	......	......	18	......	......	......	......	......	1
Somerset County	12	41	......	1	5	......	......	......	10	1	1	6	1	8
Sussex County	3	83	......	4	2	2	3	1	7	1	......	7	1	8
Union County	1	38	......	......	2	......	......	......	4	......	13	3	2	1
Elizabeth	2	111	1	2	9	2	......	......	15	4	5	4	7	10
Plainfield	1	32	......	......	2	......	......	......	4	2	4	......	1	2
Rahway	......	36	......	1	2	1	......	......	5	2	......	3	4	3
Warren County	10	40	3	1	6	......	......	......	1	2	1	8	......	11
Phillipsburg	......	16	......	......	3	......	1	......	2	......	......	2	1	2

* Atlantic City, included with county for years 1878–79 and 1879–80.
† Harrison, included with county for years 1879–80.
‡ Town of Union, included with county for years 1879–80.
§ Chambersburg, included with county for years 1878–79, 1879–80 and 1880–81.
‖ Passaic, included with county for years 1878–79 and 1879–80.
¶ Salem, included with county for years 1878–79.

Summary of Vital Facts as to Occupations, from New Jersey Marriage Record, for Five Years ending June 30th, 1883.—Continued.

NOTE.—These Tables include the Marriages for Five Years, as to which the Facts here Recorded are Given.

	Machinist.	Manufacturer.	Mason.	Miller.	Painter.	Photographer.	Physician.	Plumber.	Police and watchman.	Potter.	Printer.	Restaurant keeper.	Shoemaker.	Stationer.
Atlantic County	4	3	4	1	4	......	2	1	1	......	3	......	12	......
*Atlantic City	2	1	......	......	8	......	1	......	......	......	......	1	1	1
Bergen County	11	11	14	3	26	......	8	4	1	......	16	......	7	......
Burlington County	35	3	5	12	21	......	12	3	1	2	8	1	22	......
Bordentown	6	2	......	2	5	......	2	......	......	5	......	......	1	......
Burlington City	4	3	4	5	3	......	3	2	......	1	3	......	60	1
Camden County	2	4	1	3	7	......	6	......	......	......	4	......	3	......
Camden City	71	13	7	2	27	5	13	5	5	4	40	22	24	......
Gloucester City	6	2	2	......	......	......	1	......	1	......	3	......	3	......
Cape May County	2	3	2	......	13	......	4	1	......	......	4	......	......	......
Cumberland County	2	3	1	5	1	1	2	1	1	1	8	2	25	......
Bridgeton	21	1	......	6	9	1	1	......	......	......	5	1	1	......
Millville	3	2	8	......	5	......	......	......	......	......	2	1	11	......
Essex County	21	14	12	......	23	......	9	6	2	......	10	......	11	......
Newark	234	54	77	5	134	7	36	35	20	4	53	7	173	6
Orange	......	5	8	1	11	......	3	7	......	......	4	......	4	......
Gloucester County	9	1	6	11	4	......	4	1	......	......	6	1	4	......
Hudson County	9	1	3	1	10	......	2	2	1	......	7	......	3	1
Bayonne	5	2	4	......	2	......	......	2	3	1	......	......	4	1
†Harrison	......	......	......	......	3	......	......	1	......	......	......	......	......	......
Hoboken	37	4	13	2	23	4	16	8	2	3	14	9	19	1
Jersey City	143	32	15	2	86	3	31	27	25	1	52	8	33	
‡Town of Union	3	1	6	......	7	......	......	1	......	......	......	3	3	......
Hunterdon County	7	5	3	16	16	......	8	1	1	......	4	1	14	......
Mercer County	5	2	6	6	5	......	6	......	......	26	2	......	4	......
§Chambersburg	1	......	3	......	1	......	......	......	......	7	......	......	......	
Trenton	46	14	9	5	28	4	7	9	3	204	18	4	9	1
Middlesex County	9	8	8	4	18	1	9	1	2	3	3	......	11	......
New Brunswick	22	6	2	2	12	1	4	6	2	......	6	......	20	......
Monmouth County	8	9	35	18	55	3	17	5	1	1	11	7	6	......
Morris County	17	6	13	11	22	1	12	3	......	1	11	2	7	......
Morristown	3	2	6	......	4	......	4	1	......	......	......	......	4	......
Ocean County	5	2	4	3	3	......	1	......	......	......	2	......	3	......
Passaic County	8	3	6	3	3	......	1	1	1	......	5	......	......	......
‖Passaic City	10	3	1	1	7	1	1	......	......	......	1	3	......	......
Paterson	179	13	19	5	46	2	15	18	9	......	18	1	78	......
Salem County	1	......	2	4	5	......	1	......	......	......	3	1	6	......
¶Salem City	2	......	......	......	3	......	1	......	......	1	......	......	......	
Somerset County	10	7	7	6	3	1	10	2	1	3	3	1	3	
Sussex County	6	1	9	10	8	......	6	1	1	......	3	......	10	......
Union County	5	1	4	......	7	......	3	......	2	......	3	......	4	......
Elizabeth	73	9	9	1	23	......	3	4	4	3	5	1	3	1
Plainfield	6	3	2	......	2	......	3	1	......	......	......	1	......	2
Rahway	5	9	4	......	11	1	3	1	......	1	2	......	1	
Warren County	10	7	2	18	12	......	8	......	......	......	4	1	3	......
Phillipsburg	6	3	2	2	6	......	......	2	......	1	4	......	......	......

* Atlantic City, included with county for years 1878–79 and 1879–80.
† Harrison, included with county for years 1879–80.
‡ Town of Union, included with county for years 1879–80.
§ Chambersburg, included with county for years 1878–79, 1879–80 and 1880–81.
‖ Passaic, included with county for years 1878–79 and 1879–80.
¶ Salem, included with county for years 1878–79.

Summary of Vital Facts as to Occupations, from New Jersey Marriage Record, for Five Years ending June 30th, 1883.—Continued.

NOTE.—These Tables include the Marriages for Five Years, as to which the Facts here Recorded are Given.

	Stone cutter.	Surveyor and civil engineer.	Tailor.	Tanner.	Teacher.	Telegrapher.	Tobacconist.	Weaver.	Wheelwright.	Worker in S. W. & C.	Other trades.	Merchant.
Atlantic County			5	1	2	3	2	3	3	3	37	15
*Atlantic City		1						1			33	7
Bergen County	2	2	2		12	3	1	13	3	10	108	48
Burlington County				2	7	7		2	6	2	100	51
Bordentown	2		1		1	3	1	1			37	6
Burlington City	3						1		1	1	42	4
Camden County					4	2		4	4		31	15
Camden City	8	5	6		1	10	6	20	9	9	308	112
Gloucester City								11		3	30	6
Cape May County	2				6	1	1		2		27	16
Cumberland County	1		2		8	1			4		42	54
Bridgeton	3		1		2		1	1	1	1	56	19
Millville			2		1		1	1		3	69	93
Essex County	3	2	3	3	10		3	10	3	4	147	62
Newark	44	5	149	92	24	14	6	11	7	14	1281	206
Orange	1	1	3		1	1	3			1	68	[illegible]
Gloucester County	2				8	3		6	8		57	37
Hudson County	4		2	1	3	1		3		15	63	28
Bayonne			1		1						25	21
†Harrison	1										16	1
Hoboken	1	1	13	1	7	3	3	5	2	9	239	119
Jersey City	13	10	29		13	23	12	19	2	11	599	368
‡Town of Union	6		13		1			12	1	16	58	9
Hunterdon County	2	1	1	1	21	13		1	7	1	53	61
Mercer County	2	1		2	11	6	3	2	5	2	55	31
§Chambersburg			2								19	
Trenton	4	1	12	2	5	10	2	4	3	4	297	59
Middlesex County	2	2	1		1	11	4	1			56	62
New Brunswick	2	2	5		1	12		1		7	92	24
Monmouth County		6	9		10	7	2	1	7	1	165	99
Morris County	2		1		16	6		3	4		329	57
Morristown	1	1				1					23	9
Ocean County		2	1		6	3		5			24	23
Passaic County	1				1			7	1	2	49	15
‖Passaic City					1			8		6	57	8
Paterson	5	2	15	3	7	15	1	177	2	321	448	60
Salem County	1		1		2	4	1	1	3		27	15
¶Salem City	1					1					17	7
Somerset County	3	3	1		4	5	2	22	3	2	37	38
Sussex County	2		1		15	1		1	4	2	67	37
Union County			7		4	2				1	30	16
Elizabeth	3		3	6	4	8	1	1		[illegible]	177	51
Plainfield		1	3	1	1	2					60	16
Rahway			5		2	3	1		2	[illegible]	47	11
Warren County	3	2	5	3	13	10	1		2		138	45
Phillipsburg	1	1									46	11

* Atlantic City, included with county for years 1878-79 and 1879-80.
† Harrison, included with county for years 1879-80.
‡ Town of Union, included with county for years 1879-80.
§ Chambersburg, included with county for years 1878-79, 1879-80 and 1880-81.
‖ Passaic, included with county for years 1878-79 and 1879-80.
¶ Salem, included with county for years 1878-79.

Summary of Vital Facts from New Jersey Birth Record for Five Years, ending June 30th, 1883.

NOTE.—These Tables include the Births for Five Years, as to which the Facts herein stated are given. In three instances, viz.: in Atlantic City and Salem City, for two years, and in Passaic City, for one year, the Births of the Cities are included with their respective Counties.

	Male.	Female.	Previous children.	Number living.	Native father.	Foreign father.	Native mother.	Foreign mother.	Mixed parentage.	Black.	Population, 1880.
Atlantic County	808	751	4,480	3,405	1,262	277	1,321	227	132	18	18,727
Atlantic City	172	125	832	600	275	27	283	26	17	21	5,477
Bergen County	1,700	1,639	9,676	7,309	2,127	1,226	2,207	1,078	423	116	36,786
Burlington County	2,112	1,929	10,624	8,340	3,636	333	3,776	270	176	111	42,533
Bordentown	295	302	1,777	1,316	492	107	509	73	61	38	5,334
Burlington City	303	309	1,546	1,198	491	41	587	34	25	56	7,237
Camden County	827	630	4,488	3,373	1,435	196	1,517	199	134	177	13,936
Camden City	1,845	1,750	9,103	6,587	2,492	619	3,046	455	356	167	41,659
Gloucester City	348	343	1,957	1,433	456	226	487	201	155	....	5,347
Cape May County	545	495	2,734	2,176	998	26	1,026	23	30	66	9,765
Cumberland County	1,039	901	5,990	4,024	1,734	176	1,793	143	101	79	21,375
Bridgeton	556	533	2,[illegible]	1,987	954	100	1,017	76	43	71	8,722
Millville	591	573	3,203	2,436	1,031	112	1,078	53	57	6	7,660
Essex County	2,078	2,013	11,044	8,652	2,524	1,474	2,938	1,260	626	81	40,216
Newark	9,[illegible]	[illegible]	67,491	43,618	5,101	9,169	7,331	7,663	3,129	253	136,[illegible]
Orange	1,072	1,017	6,890	5,378	926	1,159	1,017	1,078	388	76	13,207
Gloucester County	1,617	1,490	8,130	6,350	2,721	357	2,879	232	213	132	25,886
Hudson County	725	680	4,760	3,331	531	843	644	731	241	1	10,104
Bayonne	505	472	3,914	2,251	336	566	311	536	149	4	9,372
Harrison	300	363	2,102	1,459	328	337	330	331	118	....	6,898
Hoboken	1,864	1,912	12,624	8,707	970	2,780	1,205	2,343	758	4	30,999
Jersey City	3,775	3,561	22,942	15,706	3,084	4,144	3,622	3,614	1,456	62	120,722
Town of Union	399	355	2,609	1,497	203	545	291	461	153	....	3,949
Hunterdon County	1,775	1,713	9,059	7,408	3,263	290	3,374	214	129	34	38,570
Mercer	1,167	1,089	5,905	4,548	1,675	314	1,757	406	217	162	22,716
Chambersburg	162	152	1,010	761	150	171	166	154	43	1	3,437
Trenton	1,526	1,411	7,357	5,623	1,364	1,009	2,125	805	446	83	29,910
Middlesex County	1,763	1,679	9,103	7,064	2,204	1,203	2,396	1,037	372	70	35,120
New Brunswick	1,076	1,044	6,346	5,093	1,379	719	1,519	591	337	49	17,166
Monmouth County	2,966	2,771	14,852	12,584	5,007	693	5,177	592	398	272	55,538
Morris County	2,247	2,075	12,951	10,212	3,127	1,191	3,293	1,040	487	37	44,694
Morristown	241	284	1,476	1,306	431	131	435	129	57	31	6,837
Ocean County	815	753	4,623	3,733	1,498	63	1,485	83	39	6	14,455
Passaic County	562	534	3,287	2,599	811	382	831	265	143	18	11,297
Passaic City	453	431	3,002	2,133	319	524	340	507	201	17	6,532
Paterson	3,670	3,366	21,104	14,930	2,839	4,239	3,310	3,741	1,401	70	51,031
Salem County	1,105	984	5,306	4,288	1,969	93	2,042	75	55	163	19,523
Salem City	164	135	995	416	298	20	309	12	10	21	5,056
Somerset County	1,249	1,222	6,854	5,671	2,006	457	2,190	335	263	143	27,162
Sussex County	745	699	3,770	3,028	1,346	139	1,403	80	60	4	23,539
Union County	573	531	3,378	2,727	734	364	802	296	143	28	22,783
Elizabeth	1,984	1,838	11,166	8,541	1,792	2,060	2,170	1,643	743	47	28,229
Plainfield	440	409	2,416	1,844	616	218	648	197	84	63	8,125
Rahway	260	272	1,458	1,161	422	121	441	109	64	28	6,455
Warren County	1,606	1,535	8,315	6,634	2,706	398	2,841	323	151	39	29,089
Phillipsburg	573	578	3,647	2,874	878	262	675	165	124	....	7,181

Summary of Vital Facts from New Jersey Death Record, by Counties, for Five Years ending June 30th, 1883.

Counties.	Deaths at all ages. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Principal causes of death. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Atlantic	436	253	178	445	433	4	84	11	26	4	24	91	255	228	137	120	89	51	147	15	107	42	3	19	27
Bergen	596	454	256	889	736	94	50	6	97	11	25	100	254	406	373	341	200	102	201	16	156	68	6	33	57
Burlington	907	629	383	1,234	1,295	49	137	16	60	17	47	195	417	695	390	276	289	143	357	24	246	99	16	55	56
Camden	1,675	966	678	1,859	1,192	81	249	158	193	11	57	246	801	687	584	454	318	141	429	17	224	122	10	65	80
Cape May	151	72	59	146	196	7	31	......	15	3	10	25	72	75	56	47	21	15	66	3	30	26	2	4	9
Cumberland	636	473	321	800	623	9	182	1	90	18	19	204	316	488	318	214	184	86	230	15	154	86	8	34	47
Essex	4,707	3,497	2,059	6,341	3,472	330	554	26	945	124	201	1314	1,966	3,002	2,424	1666	969	692	1251	104	794	392	45	229	242
Gloucester	473	247	184	570	649	30	68	9	39	7	19	50	236	365	212	130	132	43	150	11	117	44	7	13	30
Hudson	5,673	4,747	2,441	7,357	2,730	392	554	351	968	186	177	1436	2,766	2,645	2,574	2348	934	590	963	97	827	332	47	257	493
Hunterdon	415	202	251	677	1,008	37	75	1	65	9	17	122	196	315	248	107	211	85	310	19	141	76	11	33	51
Mercer	1,160	690	511	1,807	1,280	51	138	23	174	19	35	209	645	917	623	312	264	145	402	38	243	135	24	57	95
Middlesex	1,036	623	450	1,357	1,047	51	106	12	128	14	51	251	522	623	464	273	222	164	284	20	218	108	11	86	124
Monmouth	1,096	580	416	1,198	1,288	39	90	6	95	8	52	182	583	649	443	280	314	177	398	14	266	101	16	46	118
Morris	862	599	434	1,269	1,155	116	78	......	165	24	37	168	331	538	569	287	249	137	471	24	189	81	31	63	108
Ocean	207	106	96	302	371	3	25	1	17	1	13	60	89	175	91	62	46	16	77	6	69	16	6	15	17
Passaic	2,001	1,303	791	2,299	1,379	138	164	42	316	47	68	314	1,069	1,098	844	650	367	230	380	34	312	128	35	88	102
Salem	438	220	208	445	580	26	63	7	22	6	23	80	184	307	272	91	93	45	161	21	165	52	8	18	30
Somerset	393	223	210	566	645	56	56	3	32	13	13	110	184	259	242	109	143	78	215	14	136	50	15	25	48
Sussex	249	200	186	515	527	41	55	......	76	3	9	75	165	237	164	101	118	53	160	11	72	40	6	27	41
Union	1,164	818	514	1,568	1,134	106	92	6	174	30	49	301	644	694	606	453	375	134	328	31	209	106	11	45	112
Warren	649	442	345	791	725	37	84	10	136	15	12	172	372	346	340	216	148	75	229	21	144	41	12	33	73
Totals	24,959	17,386	10,961	33,477	22,495	1721	2818	689	2857	573	968	5719	11,768	15,077	11,364	6609	5575	3199	7247	535	4769	2115	318	1185	1990

Total deaths in the State, for five years (including supplements), was 109,906, and the average death-rate, 19.43.

Rates for short periods, or which deal with small numbers, are only approximate, and sometimes misleading, since temporary causes may have been in operation, and small numbers do not eliminate or balance errors which practically disappear in large aggregates. So, five or ten years analyses are much more important than any single year. The number of deaths before twenty, in proportion to the rest, are much more informatory as to local causes affecting health, than the total deaths. So, also, the number dying from the symotic diseases, and especially from fevers, croup, diphtheria, diarrheal diseases, consumption, and brain and nervous diseases of children.

Summary of Vital Facts from New Jersey Death Record, in Cities of over 5,000 Population, for Five Years ending June 30th, 1883.

CITIES.	DEATHS AT ALL AGES.					PRINCIPAL CAUSES OF DEATH.																			
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Atlantic City	187	130	48	153	100	......	13	......	16	1	8	33	121	68	42	45	36	20	46	11	27	14	1	6	19
Bayonne	259	198	73	274	90	10	13	......	22	4	10	54	124	93	123	107	28	26	28	7	31	9	......	7	32
Bordentown	69	59	30	148	126	5	6	1	7	2	3	19	28	83	30	44	39	16	39	4	16	10	......	7	6
Bridgeton	177	120	90	283	195	3	36	......	22	......	9	87	85	116	80	51	54	15	50	4	42	12	2	6	15
Burlington City	115	103	72	224	176	11	13	2	7	1	8	36	54	140	63	37	47	34	55	9	31	9	3	12	12
Camden City	1,062	715	499	1,279	689	56	162	147	148	7	87	187	543	594	388	349	199	104	256	8	120	93	7	37	47
Chambersburg	152	80	76	148	80	6	22	......	29	4	7	29	67	77	60	35	16	8	29	4	29	12	3	8	2
Elizabeth	669	512	308	792	480	42	39	1	105	15	33	155	315	334	309	278	137	59	160	8	110	52	6	19	63
Gloucester City	137	56	60	143	79	5	15	......	6	4	2	16	61	81	42	46	15	7	29	1	17	5	2	8	9
Harrison	172	133	78	228	73	28	31	......	34	3	11	23	81	99	85	92	19	12	23	1	16	8	3	7	13
Hoboken	1,076	670	360	1,200	370	37	72	35	132	20	36	376	547	474	438	531	180	115	150	22	114	63	14	52	72
Jersey City	3,650	2,986	1,568	4,645	1,694	218	361	254	645	144	122	825	1774	1860	1668	1437	610	334	611	57	584	215	27	163	296
Millville	183	164	102	188	117	....	38	......	43	14	9	57	106	124	83	58	26	21	32	2	27	12	1	3	8
Morristown	106	90	52	220	194	13	6	......	8	1	9	29	62	101	75	48	33	25	109	2	25	14	2	6	11
Newark	3,753	2,872	1,637	5,151	2,470	245	374	24	778	101	148	1040	1574	2370	1857	1456	740	531	949	67	611	298	37	167	191
New Brunswick	441	271	208	491	346	19	47	9	65	12	28	114	215	243	185	121	84	73	99	11	62	50	2	7	28
Orange	331	231	127	408	187	7	22	......	51	7	21	66	130	198	201	128	51	34	61	8	35	26	......	17	14
Passaic City	214	130	69	173	90	6	19	......	19	2	10	33	106	82	71	78	37	23	22	5	19	5	3	11	14
Paterson	1,630	1,065	637	1,887	1,009	91	134	42	266	45	52	255	905	913	680	520	270	150	278	21	285	108	17	64	63
Phillipsburg	202	117	76	163	93	5	21	......	28	2	6	69	69	74	56	59	26	6	46	......	26	5	1	11	13
Plainfield	164	96	67	174	164	4	12	1	14	7	3	30	93	104	84	54	31	28	30	5	24	12	3	3	14
Rahway	130	79	59	229	202	13	9	3	27	5	4	13	56	115	96	49	44	18	53	9	30	20	1	6	7
Salem City	110	48	41	134	140	9	14	2	2	......	6	20	42	82	58	17	19	9	45	......	28	11	4	6	5
Town of Union	224	201	118	181	71	16	16	4	49	8	2	132	97	88	65	88	32	24	28	3	22	11	......	8	5
Trenton	769	395	278	1,022	599	31	66	19	116	8	15	108	324	639	282	183	135	82	210	17	142	59	15	31	48
Totals	15,992	11,722	6,741	19,938	9,436	940	1361	541	2638	416	594	3449	7376	9072	7130	5985	2900	1806	3447	296	2455	1127	104	675	1011

Cities are generally more unhealthy than their death-rates indicate since the population is in many of them much decreased for four months in the year, and thousands remove themselves instead of removing the evils which distress and sicken those who remain. Hence, in many of our cities, the death-rate for June, July, August and September, reckoned for the remaining population, is a fair criterion of the health of locality, or at least should be considered for purposes of correction. So health laws are a great defence to all, but especially to the working classes of cities. It is a question of labor and social science and art, as well as of comfort and hygiene.

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EIGHTH ANNUAL REPORT

OF THE

BOARD OF HEALTH

OF THE

STATE OF NEW JERSEY.

1884.

TRENTON, N. J.:
JOHN L. MURPHY, STATE PRINTER.
1884.

THE STATE BOARD OF HEALTH.

Hon. HENRY C. KELSEY, Secretary of State, Hon. JOHN P. STOCKTON, Attorney General, GEORGE H. COOK, State Geologist,	Members *ex officio*.

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Recording Clerk	E. A. OSBORN.

REPORT OF THE SECRETARY OF THE BOARD.

To His Excellency Leon Abbett,

GOVERNOR—In presenting to your Excellency the eighth report of the State Board of Health of New Jersey, it is gratifying to be able to speak of the year as one of comparative healthfulness in the State. It is equally encouraging that those of most intelligence, and who have most to do with the moulding of public opinion, are more and more realizing that the health of the people is a vital consideration as to the public prosperity. It is not merely that the ravages of epidemics teach us what a burden these are upon the industrial and monetary interests of a people. Whatever of time, of money and of happy enjoyment are lost by the weariness and waste of avoidable sickness, is a tax on the welfare of all citizens, and so upon the industrial energies and contentment of the population. It is high time that the increase of our resident population and the health and the life of the people had other consideration than that which speaks of it as merely a desirable comfort to be patronized or approved. The healthy man, woman and child are the most valuable of our resources, and are to be fostered and protected with all the forethought and care with which we would guard the honor of the State, or the materials from which it derives its prosperity. They are its productive capital more than the richness of soil, the value of metals or the constructions of machinery. If there is not a vigor of life among the people, there is a constant constriction upon the power which, foremost of all, is indispensable to the development of the State. In our list of resources, families which have homes of health take the first rank. Government and law have few, if any, higher duties than to protect them from the ravages of untimely death, and from those avoidable impairments of vital force that are paralyzing in their effects on prosperity and progress. In the world, there is no value but in human life, and human life has the greatest value when healthy and moral. It is only when we can carefully examine into the health

condition of the people that we can at all realize the burdens that are pressed upon the population by avoidable diseases and untimely deaths. If we turn to the home we find that through the want of requisite information, or by reason of defective drainage, imperfect construction of buildings, or defective methods for the removal of all debris, the inmates are exposed to bad air or to taint of food or water such as must make wasteful demands on vital force, or cause actual disease. If we look into the schools we find pupils subjected to many disabilities in the very process of what we call education.

If we go into the workshop, where the laborers should have healthy surroundings and all the reasonable aids and appliance for health, we too often find that there are various insanitary conditions, and that the average effective life of the laborer is so short as to tell a sad tale of result. If we inquire into actual cases of disease, and the history of epidemics, we find that much of the sickness, suffering and fatality are the result of palpable mistakes and failures in health-care. If we look for evidences from experience to prove what can be done to relieve such conditions, to lower death-rates, and to increase human endurance, the amount of testimony is such as carries conviction to all. The veteran sanitarian, Edwin Chadwick, C. B., at a recent meeting of the Association of Public Sanitary Inspectors, in London, said: "Boston, by improvement in the house drainage, appears to have made an advance from the present common death-rate of the Italian cities, of thirty in a thousand to twenty in a thousand, or about one-third; but it may be confidently affirmed that, by a better self-government and administration of more complete plans, it might gain another third, as has Croyden, where the death-rate, which was twenty-eight in a thousand, is now thirteen in a thousand; or Dover, which was twenty-eight, and now is fourteen; or old Salisbury, with a like gain. But even of such instances, I consider that by the application of the half-time principle of mixed physical and mental training, advances may be made from the death-rates of eleven in a thousand of the children of the school stage of life, to the death-rates even of three in a thousand, obtained in the district half-time schools, or that death-rates of not more than ten in a thousand may be obtained as the average death-rate of a well-governed city. It has become evident that a constant and intelligent oversight of the public health is one of the great prerogatives of government, and so weighty a concern that it must be superintended with administrative skill. While requiring

the aid of the sciences and the professions, and the knowledge to be derived from experience, it also needs the power of the law and its enforcement under the guardianship and direction of the courts. It is encouraging to know that the period of half knowledge and painful experimentation is fast passing away, and we can now say we know the nature and extent of the work which lies before us; we know every day more fully the principles and details which should guide us in carrying it out; and, what is more, we can rely more safely and surely upon the steady growth of intelligent conviction which is rapidly influencing all classes of the community, and enlisting their services in the grand policy of prevention. In addition to the rapidly increasing information as to all sanitary matters, we are able to refer to the former reports of this Board, and to its various circulars, as containing information of much value to the citizens of the State. As being also in constant correspondence with the members of local Boards in all parts of the State, we are constantly able to give to these Boards such information as they may need for an intelligent supervision of their work. This Board is provided by the State in order that, among other duties, it may aid in the dissemination of information, and may instruct local authorities as to their duties. We subjoin herewith reference to a few of the subjects which, at the present time, seem to us most prominently to call for consideration on the part of the citizens of the State.

WATER-SUPPLY.

The importance of a pure water-supply has never been over-estimated, while the difficulties in the way of securing it are constantly multiplying. These are by no means insurmountable, but often involve considerable outlay at the start. It is an occasion for rejoicing that it is probable many of our sea-side resorts can secure a good supply by means of driven or bored wells. Where they have been put down under skilled advice as at Cape May, Ocean Grove, Asbury Park, &c., they have thus far proved successful. Other places, not too compact, depend upon the old form of well. Here the caution as to surface drainage and organic matter near at hand is better understood than formerly. But as not infrequently well-water becomes contaminated by refuse or organic matter in the soil, or pollution from about the curb or pump, the greatest care should be exercised. In some instances the best source of supply is similar to that of Prince-

ton, where advantage is taken of a few hills as a water-shed, and a series of springs are tapped for a supply. These being replenished by the constant source of rain, and the water being filtered through the ground, a good and constant supply is secured. The most serious question is that which relates to the supply of large cities, especially those which, by reason of level position or nearness to tide-water, are not likely to find an abundance of potable water near at hand. Within thirty miles of New York city is to be found half of the population of the State of New Jersey. Of this number, according to the careful and discriminating judgment of engineers, chemists, physicians and boards of health, not one-half are supplied with water fit to drink. It cannot be claimed that the unfitness of the Passaic river, as a water-supply, is any new fact, although the rapidly increasing population magnifies the greatness of the evil. Long ago the State Geologist and various local correspondents pointed to the facts in evidence. Chemists and others, who have begun investigations with the idea that the evils have been magnified, or that they could be remedied by local action, have forsaken such views. The State Water Commission and the chemist of the water boards fully substantiated views already entertained. Nor is it enough to point to the fact of no very great mortality. When so great a city as London can point to a death-rate of only twenty per thousand, and many an English town of 30,000 inhabitants, to a death-rate of only sixteen to eighteen, it will not do for us to claim that Hudson county, with an average death-rate for the whole county of 26.58, and Newark, with a death-rate of 25.49, are in a good sanitary condition. The fact is still more significant when it is remembered how largely the cities are depopulated during the summer, and how many of the deaths that occur are of that zymotic class which largely depends on local evils. No section of country within one hundred miles of New York city has more natural or business attractions that our own State. But if there is neglect of sanitary care, and especially of a good water-supply, it is too late to adopt the policy of concealment, or to point to a death-rate of, say, from twenty-six to thirty as a justification. Such a sustained death-rate in healthy times points to a fearful death-rate if pestilence broods over such nests. Besides, there are evils of sickness, of invalidity, of debility, of depression of vigor, that do not always express themselves decidedly in an increasing death-rate. Where the vigor of population is in any-

wise impaired, and the marriage-rate and birth-rate decreased, these as well as the death-rate are indices of burdens upon prosperity and upon labor, of which those resulting from avoidable disease are the most pressing. It is most noticeable how, in the larger cities of Great Britain, their merchant-princes and their great manufacturers point with pride to the water-supply. If Liverpool has its difficult health problems, it shows a delightful source of water-supply from the hills beyond. If Glasgow has a foul Clyde, it tells you that its people drink only the water of Loch Katrine, stored and filtered amid the great hills of Scotland. London, with its various water companies, is constantly on the alert as to the purity of supply, and by most extended filtering works largely makes up for deficiencies which would otherwise not be tolerated. As our risks from impure water are even more than those from ordinary impure air, it behooves our cities more and more to guard against any contamination of potable water. In the various reports of the State Geologist, and of this Board, as well as in that of the Commissioners of State Water Supply, are to be found valuable facts as to real conditions and as to available sources of water-supply. The great error in some localities has been a too hasty commitment of city interests to some incorporated company. Some of these are excellent and quickly respond to public demand when the water becomes insufficient in quantity or inferior in quality. Others, having become established and profitable investments, resist any popular outcry that requires expense, or very slowly respond to just complaints. A committee at Asbury Park, in a comparison of water-rates in places where the water has been introduced through works owned by the borough or city, found that the rates were over thirty-three per cent. in favor of consumers, as compared with those of incorporated private companies. In other instances, cities have too hastily chosen sources of water-supply on the judgment of non-expert committees, or of engineers little versed in this line of inquiry. The conditions of an efficient water-supply are now so well understood, and the resources of our State in these directions are so good, that no more blunders should occur. We must still urge upon the counties of Passaic, Essex, Union and Hudson the advisability of considering modes of a combined water-supply for the over 500,000 people they contain, and in view of the prospects of a rapidly-increasing population.

SCAVENGERING.

With all that we hear about polluted ground, sewers, etc., we are to remember that the most radical and effective way for keeping the soil clean, is not to allow uncleanliness to get into it. This means a thorough system of scavengering, so prompt as to secure the removal of decomposable or putrescible material before there is time for it to change, and of all cast-off material so that it shall not accumulate in quantities. It also is made to include the emptying of such receptacles as do not find conveyance and discharge through sewers.

Sir Robert Rawlinson, C. E., who has been so largely identified with English systems of sewerage, says: "Since the year 1848, the date of the first Public Health act, very many millions sterling have been expended on main sewerage and house draining; on establishing water works, and on street improvements. I have had something to do with the movement, and must plead guilty to some of the expenditures. I have no reason to repudiate this class of works, but I do wish to exalt something much simpler and cheaper—namely, systematic and thorough scavengering, as unless this is established and attended to, the Sanitary Engineers will, to a considerable extent, have worked in vain. On the full and proper execution of surface scavengering will depend the crowning results of modern sanitary measures. All that water can remove must be washed away; all matter liable to become putrid must be consumed by fire or promptly removed. There must be no large heaps of refuse stored or sorted to enable portions to be sold as manure. The work consists in—

1. The removal of house offal.
2. Removal of ashes and dry house dirt.
3. Cleaning of street and catch basins.
4. Cleaning of cesspools and privy vaults.
5. Removal of manure and other animal refuse.

The first is strictly the refuse from the cleaning of meats, of poultry, of fish; the scrapings and peelings of vegetables; used-up rags or house-cloths, and should be cared for quite distinctly from the dry dirt and rubbish of the house and its surroundings. As it is, much of it, putrescible matter, it needs to be gotten rid of often, especially in hot weather, and with a regularity which will never disappoint. The one essential point is that all these different matters must be regarded as so important as to require a definite and comprehensive plan for

their management." Perhaps no city in the Union has so long been successful in this respect as Boston. In the fifth report of the American Public Health Association, 1879, Eliot C. Clarke, C. E., gives a detailed description of the organization and carrying out of the system. The model should be closely studied by all of our larger cities, many of which have very imperfect plans. Asbury Park, as one of our smaller cities, but as having a rapid summer influx of population, deserves to be singled out as planning fully to carry out a system of surface cleanliness. The method for dealing successfully with all the forms of material is now well understood. If they are kept distinct the problem is greatly simplified. The swill cart gladly receives the first. The ashes and dry house dirt are available for sifting for cement or asphalt pavement, or for in-filling for low places. The street mud is of value in the surrounding country, and when of great bulk is so collected as to be reduced under pressure, as is now profitably done in Glasgow and other cities. With the various forms of excavating apparatus and the decreasing number of cesspools and privy vaults, this department can also be well conducted. The outside vaults can be cleansed by sulphur fumigation. The removal of manure and animal refuse, such as is represented by stables, pens, slaughter-houses and markets, requires active sanitary police vigilance and regularity; but this, too, can be accomplished. Water and air come grandly to our aid in dealing with all surface accumulations, if only we understand by water, not wetting, but washing away, and by airing, not merely the presence of air, but draughts and winds—such ventilation as flushes. All this is the more important, because when a pestilence breaks out it will not do to stir up all the "sleeping dogs" of disease, or to remove, amid heat and moisture, materials which ought never to have accumulated.

DISPOSAL OF ALL HOUSE WASTE.

As the sanitary condition of each house has to do with the health of its inmates, and as a pest-house, even in its most moderate definition, cannot but have effect upon localities adjoining it, or persons passing it, the healthy character of each building becomes a public concern. With the great tendency that population has to center in cities, and with the fact that over one-half of the population of New Jersey is already enclosed in cities of over five thousand inhabitants,

we cannot be too watchful as to these domiciliary conditions. So much depends upon the choice of a healthy site, the proper preparation of the ground by under-drainage, and upon the construction and material of the building, that most of the largest and most advanced cities of Great Britain, and of our own country, recognize this as too much of a public concern to be left to the option of each individual. Hence, building plans of extended alteration are now submitted to competent judges in order that it may be known that proper provision is made for the safety and health of those who are to occupy them. Thus are not only valuable suggestions secured, but impositions upon occupants are prevented, which, unless hindered in this way, they are too often powerless to prevent. We see no other plan upon which proper dwellings can be secured, and by which especially the industrial classes in towns can be protected from the most serious tax upon their industry and resources. As it is practically impossible for each householder in a city fully to provide for the removal of every form of debris, or to determine, independently of his neighbor, what plan shall be adopted, it is incumbent upon all cities and city authorities to regulate certain matters as to the disposal of all "offaling" of the household. It has long since come to be recognized that the use of a cesspool which is to receive the liquid filth of the house, and distribute it through the soil, can only be defended under certain conditions. While a proper soil and proper cultivation, and a proper distance from the house and the well, may make this tolerable in the country, it is always a questionable, and often a dangerous method, where houses join each other closely on streets, or are only separated on the rear by yards of small depths. The risk is greatest where the dependence is upon wells for water-supply, but as foul air is harmful, as well as foul water, the risk is removed only in part by reliance upon a different kind of water-supply. The resort to closely cemented cesspools is safe, but this involves so much expense in the removal of the liquid as to deter many from this method, except where there is a city system of disposal. Hence, sewers have come to be the reliance of most large cities. The proper construction of these is now so well understood, and they are now so well brought to a reasonable expense as to make their use far more extended than formerly. The great difficulty as to them now arises from two sources. Too often the house systems or inside connections are imperfect, so that more so-called sewer gas is generated in the house system than in

the main sewers. The remedies for this, also, are now much better understood than formerly, and where building is under sanitary supervision, and plumbers are licensed or their work inspected, the evil is fast being remedied. Another and great difficulty arises as to the disposition to be made of the liquid sewage as it flows away from the outfalls of the various main pipes that carry it away from the building and from the streets of the city. The most usual method is to discharge it into some adjacent stream. Thus many a little brook flowing through a village or city becomes the receptacle of a stream of sewage, larger than its own volume, and especially so in the summer months, and in times of drouth when the sewage especially needs dilution. That air and water have much power in decomposing fresh sewage and in removing its disease-producing qualities is well known; but where the limits of this are found by experiment and experience to have been reached, it is very hazardous thus to use these small streams. Where a river is used, very much depends upon the soil and the cultivation of the country through which it runs, upon the density of population along its banks, and upon conditions actually found to exist as to the quality of its water. Chemical, microscopical, biological and botanical investigation afford great aids, while the careful observation and experience of physicians, not only as to specific disease or death, but as to the more general vital condition of the population are of the utmost importance. Where it is not found permissible to introduce sewage directly into a stream, various and often successful devices are resorted to. One, is so to impound and hold the sewage for a few hours as to discharge it in bulk while yet fresh, with the outgoing tide, and so by quantity and the direction and force of flow facilitate its conveyance to more open waters. This will do in some places, as on the English coast, where there is a rise of tide of twenty or more feet, but seldom does where the natural fall is small, and where the rise of tide is inconsiderable. A remarkable experiment in this direction was tried a year or so since to relieve a part of the sewerage of Newark. The delivery of the Sixth Ward sewerage into small creeks on the meadows having become an intolerable nuisance, the idea was conceived of digging two canals out to the bay, one of which should hold the sewage, and the other catch and impound the tide. This was attempted to be done with a fall in the first ditch, so small as was sure to be inoperative whenever a sludge had been precipitated by gravity, and by the salt water acting

on the sewage material. Besides the amount of water this impounded was not sufficient for the purpose. The Secretary of this Board gave reasons before some of the citizens why the plan would fail, and advised if anything of the kind be attempted, that reliance should be had upon a pumping station near the terminus. It was concluded, however, to try the experiment, which, at an expense of about $75,000, has proved a total failure. Another more common method where the adjacent stream cannot be used, is to construct sewer pipes or mains far out into broad, and deep, and rapidly-moving waters. This is often a great relief. Yet, after several years, as in the case of the lower Thames, the deposit becomes a great embarrassment. Another plan is to resort to system of irrigation by which the liquid is sprinkled or poured over properly prepared land, and so is ærated and undergoes chemical charges, and is appropriated by growing crops. Generally such irrigation is so managed as to constitute what is known as intermittent filtration, so that instead of continuous flow, plats of land are showered and then have rest. Thus the air and the water-supply to the soil are alternated, and the desired changes go on much more rapidly.

Another plan is to secure this intermittent flow by means of flush tanks and a small-pipe system about a foot under ground, and so irrigate a little below the surface instead of upon it. Methods have repeatedly been introduced to act by gravity and settling basins, by machinery and by chemicals upon the sewage so as to change its character; so as to receive from it its suspended and much of its dissolved matter, and secure what is valuable of it and send the purified water into streams or upon lands. The great difficulty has been that the sludge thus precipitated or separated, has itself had to be dried at large expense and that the material left was bulky and not found valuable enough for land to pay for its separation. Some recent advances as to the compression of this sludge have been made, which much cheapen the cost and gives a condensed manure of value enough to make the reduction of it practicable. This will help to solve the sewage problem for many large towns not on large rivers, and much facilitate the removal of such material. Since our last report the subject of sewage disposal has occupied the attention of many of our cities. Trenton has secured the services of an eminent engineer to furnish a plan for the sewerage of the city. The city of Newark has accepted the plan of several engineers for the disposal of the

sewerage of an important part of the city. The condition of the Passaic river is recognized to be such as to demand some other disposition of the sewage of Passaic City and other towns along its banks. Even with the partial relief which will be thus secured, the use of it as a source of water-supply will probably be ere long discontinued.

HEALTH IN FACTORIES AND WORKSHOPS.

Former reports have not failed to call attention to the very great importance of such State oversight of labor as shall secure for it conditions compatible with the health of operatives or such as shall in extra-hazardous trades or occupations reduce evils to a minimum. Systems of heating and ventilation are now so well understood as to make it possible to secure these so as not to impair the health of indoor operatives. Yet a very large number of factories are greatly defective in this regard. Modes of caring for the dust or particles from most industries are now well understood. The necessity of protection for machinery and of fire-escapes is admitted by all. This State has as yet passed but very few effective laws relating to the subject. Our present Factory act, although of service, has chief reference to the care of minors. Its inspectors do not claim any expert skill in the various details that relate to sanitary arrangements for buildings or the health of those in special industries. For these the English laws provide such medical and sanitary oversight as has greatly mitigated many evils. The English act of 1846 recognized the necessity of surgeons duly appointed, to examine as to the health and physical fitness of those employed among the young, and extended its protection to females. Most of the acts of 1860 dealt with the interests of children and with a regulation of the times and hours of labor. But the act of 1866 provided that every factory to which this act applies, shall be kept in a cleanly state, and shall be ventilated in such manner as to render harmless, so far as is practicable, any gases, dust or other impurities generated in the process of manufacture. Protection to health was a leading feature of this act, extending even to restriction as to the eating of meals in rooms full of dust or of particles from hazardous operations. At this time a close examination among pottery operatives showed how short were the actual working years of most potters, and how many died at an early age.

The English act of 1867 included any premises, "where fifty or

more persons were employed in any manufacturing process." In 1878, a consolidated act was passed of wide scope, including every industry under general jurisdiction, and giving special prominence to the care of the health of all workers as an industrial interest that could not be left either to the judgment of employers or of the municipality. Even in the matter of bake-shops, the reports of a commission showed such evils as to make it necessary to provide that (*a*) "no water-closet, earth-closet, privy or ash-pit, shall be within or communicate directly with the bake-house; (*b*) any cistern for supplying water to the bake-house shall be separate and distinct from any cistern for supplying water to a water-closet, and (*c*) no drain or pipe for carrying off fecal matter or sewage shall have an opening within the bake-house." References to our report of the Health Commission of 1866, and that of 1876, as well as the previous reports, will show how this matter of care of factories, work-shops and workmen has been urged upon public attention. In addition to inquiry in our last report as to the trades and occupations, observation is now being had of several of our important industries, with a view of finding out such defects as injure the health of workmen, and as to the best preventives to be applied. The requirement of the English act of 1878 was that every factory or work-shop shall be kept in a cleanly state and free from effluvia arising from any drain, privy or other nuisance, and shall not be so over-crowded whilst work is carried on therein as to be injurious to the health of workers, and shall be heated and ventilated in such a manner as to render harmless, so far as is practicable, all the gases, vapors, dust, or other impurities generated in the course of the manufacturing process or handicraft carried on therein. The results of such laws, where enforced, have fully vindicated their importance. In one of the dusty industries, that of flax or jute, we have the following testimony: "Fans have been constructed, splash-boards set up, and heat and steam effectually carried off. The masters offered the most willing testimony to these great advantages in promoting the health and comfort of their work people. Another employer asserted two years afterward, that he was at first reluctant to accept the proposed changes, but now he only regrets that his work people had not enjoyed the benefit of these changes sooner." The improvements in woolen and linen industries, in potteries, in metal trades, in printing, and bake-houses, and in numerous other occupations, have been very marked. "It is proved," says Lakeman, "that

the factory act system is capable of universal application, that no sort or condition of employment could not be made amenable to its code, that throughout the Kingdom it revealed that in all trades there were abuses to remove, cruelties to the young to be assuaged, vicious habits to be overcome, parental cupidity to be checked, avarice of many employers to be subdued, civilization, in fact, to be introduced, and order, system and sanitation, the handmaid to health, to be firmly established." While we do not favor any restrictive or arbitrary measures, save such as the welfare of population absolutely require, and while thorough knowledge and prudence are needed by officials under any such acts, we do claim, that as in the schools, so in the factories and work-shops, the State has so much at stake that it cannot afford to leave these at the option of those who may be either careless, or indifferent or uninformed. Both prudence and skill must be at command, so that the inspectors shall point out defects and secure remedies in such a way as will help both employes and employers, and commend itself to all those that are not too greedy, or too unreasonable to be swayed by facts and experience.

TENEMENTS.

A partial inquiry into the modes of rapid and imperfect house construction, and the over-crowding of families in tenement houses, leads us to feel that the time has come when general legislation should recognize, especially in cities, the necessity of some oversight of this matter. The wisdom of the New York laws, which, in this respect, gives large powers to its city Board of Health, has been fully vindicated. Several other cities give like powers. It is a most essential advance of sanitary legislation and has not been found arbitrary, but has been sustained by the court on appeal. We can point to locations in some of our cities which we have personally visited, in which the character of the buildings and the crowded state of their occupancy is not only damaging to the inmates, but a serious menace to the public. In each city, plans of new buildings, or of extended alterations of old ones, should be submitted to the Sanitary Engineers and Health Officers of the Board of Health, and should have the approval of the Board only so far as fairly consistent with the interests of public health. Ill health, idleness and vice are fostered by over-crowding, and restraint upon such construction of buildings as invites and compels it,

must be recognized as one of the great public interests of the State. Sir Robert Rawlinson, C. E., the eminent Chief Engineering Inspector of the Local Government Board of England, has recently, in three addresses, sought to call more decided attention to the study of the domiciliary provision for the people as an essential condition of social and natural prosperity. Not less important is the subject in our American and State nationalities, in which the forces of the household so soon make themselves felt at the ballot-box and in legislation. In Jersey City and Hoboken, in Newark and Paterson, and in a few other of our cities, we should not await wrong construction, but so regulate, especially as to ventilation, light, and all pipe connections, as to secure the house from becoming a danger to the general public. We are fortunate in being able, in this report, to furnish a paper from one who has had large experience in this direction. The analysis given of the New York law will be found well worthy of study.

EFFLUVIUM NUISANCES.

The attention of the Board has during the last year been called more than ever before to the evils resulting from what are known as effluvium nuisances. That the world should be without occasional unpleasant odors is an impossibility. But that communities should not continuously, or for considerable portions of time, be subjected to odors which are believed to be injurious to health, and which render the life of the ordinary citizen uncomfortable, is a principle of common law no less than the dictate of common sense. No one can look into such a law book as Wood on Nuisances, or read the articles of Counselor Atwater, a member of the Board, or refer to various decisions, both of English and American law, without seeing how clearly this opinion is asserted. If the matter be that of pig-pens or slaughter-houses, it is claimed that the people must have pigs and meat, and that it is inconvenient to have pig-pens and slaughter-houses at a distance. The answer to this is that we may have pigs and meat without nuisance, and that inconvenience is sometimes demanded for health and for comfort. Another answer is that where pens and slaughter-houses are under sanitary inspection, or careful and cleanly care, they can possibly be made tolerable. We have seen an abattoir in the midst of a large city so conducted as not to distress the residents. It is, however, because of the great difficulty of keep-

ing pig-pens, cattle-yards and slaughter-houses in favorable conditions, especially during hot weather, that most cities and villages claim that they should not be within several hundred feet of dwellings. While there is, up to a certain limit, a wonderful accommodation in the human system to organic materials, and such adjustment as to many does not cause any ascertainable injury, yet it cannot be expected that the young, or those in impaired health, or the ordinary citizen will have their senses blunted to bad smells, or their bodies hardened into resistance. It is an ascertained fact that nausea and diarrhœa and an extra demand on vital force are the result in the case of many, and that when some special contagion alights or an epidemic occurs the districts nearest to such odors and those newly brought in contact with them are most likely to suffer.

Our attention needs still more to be turned to the various forms of nuisances arising from useful manufactories. Toward these we have all that predisposition which we should have toward the development of important industries. Yet it is to be remembered that an industry which is of real advantage to a few, and yet renders life more or less intolerable to the many, becoming a general nuisance both by its unpleasantness and its menace to health, is not a real advantage to any community. It deducts from the comforts of the masses and often imperils the health of workmen. In these cases the real points to be determined are: How necessary it is to have the industry in the particular locality it occupies; how far is it really afflictive or injurious, and what means science and art furnish to overcome its evils? All of these, of course, are matters either of opinion, of fact, or of evidence, as to which courts must decide. One great error is that many of the factories fail to avail themselves of the best methods to prevent nuisance. The work itself is done in a slovenly way, or apparatus for consuming smoke or malodorous organic material is not used, or, if used, the stoker or other operative does not properly do the work. Dr. Ballard, in behalf of the Local Government Board of England, and in the interest alike of factories and of the public health, has made an admirable series of reports on various industries. We have seen many establishments so conducted, even in the midst of large populations, as not to be a nuisance or a peril. It is not the business of owners to look to those who complain to furnish the remedy, but it is their business to secure such expert aid and such apparatus as shall reduce to a minimum the evils complained of.

More still needs to be said as to a class of factories or works which directly deal with decayed or putrescible material, and which, under the names of chemical works, refineries, or fertilizing companies, are sure to become nuisances unless in the most skilled hands. The strictness of New York laws as to these, and injunctions and decisions of courts in that State, have led some of these to locate in this State. Often they are just outside of city limits, or in places where the amount of nuisance depends upon the direction of the wind. These are nuisances of which local Boards of Health should take cognizance, and do all in their power, both by inspection and by information to this Board, to either abate or control. Whether the course of procedure of a local Board should be a notice to abate; whether private citizens who are aggrieved should proceed by complaint before grand jury; or whether the case should be carried into the Court of Chancery, are questions generally to be settled under legal advice. Every citizen has, under common law, certain rights of abatement of a nuisance, and to go before the courts with his complaint. But he is too often practically helpless by reason of the effective influence of companies, or of a lack of sufficient money to contend. The State law has, therefore, wisely conferred on the local Boards of Health the same powers which inhere in the citizen, and so made it possible for the Board to become the complainant. Further than this the law cannot go. If the influence of capital and individuals can prevent a public sentiment against such nuisances, or elect Boards of Health who either fear or hesitate to do their duty, the residents of the community must suffer or move into a more correct public sentiment. It must not be complained that the law is inefficient. As a Board we do not think that there is need to lodge summary proceedings with us, although we are always found available for examination, opinion, or advice. Where there are lawyers and courts these are generally more effectual, in co-operation with local Boards, than any attempt to transfer to non-legal bodies what is the legitimate sphere of skilled legislation. The rights of local Boards should be well strengthened before the higher courts, in which there is sure to be due consideration of the rights of the citizen, as well as of those of skilled industries.

As to the petroleum nuisances at Constable's Hook, this Board has had much correspondence with the New York State Board, which has had occasion also for much complaint as to the injury done to Staten Island. The Standard Oil Company has made much effort, by new

machinery and skilled appliances, to diminish the evil. Other factories have done very little. The local Boards and citizens have their chief defense in resort to the courts. The law of last winter, prohibiting the throwing of the sludge into the river, was important, as by it our food fishes were being killed or rendered unpalatable for food, and unpleasant and noxious odors were being disseminated.

The dealing with the petroleum sludge, in order to recover from it the sulphuric acid, and the use of the crude sludge in various establishments for the manufacturing of fertilizers, has also occasioned much nuisance. In these fish, meat, bones, or other decayable or putrescible material add to the evil. The Secretary and others, in behalf of the State Board, have made careful inquiry and personal examination both directly and in aid of the local Boards. In one case a warning statement of the facts was made to the grand jury. We believe that much good has resulted and that this evil can be greatly mitigated, or, if necessary, abated, if local residents and authorities do their duty, or if proprietors will profit by methods now found efficient and within reasonable cost. The bone factories near the Passaic, and the rendering establishment on the meadows near the Hackensack, still furnish to the traveling public, and other long-suffering worthies, their annual tonnage of scented particles, but no local Boards have attempted opposition. From Newark many complaints have reached us as to continuous foul smells and odor factories, but as no individuals have instituted proceedings and as the city Board of Health, if strong in its individuality, is weak before the law, no relief has been sought. In general it can be said that if only localities and local Boards would judiciously and prudently, yet promptly, do all that the laws of the State and the higher courts provide, there would be far less menace to the public health.

OUR SCHOOLS AND HYGIENE.

The importance of considering the physical education of the young more and more presses itself upon the attention of this Board. As it is always difficult to change the habits of those of mature age, the chief progress in any permanent improvement of the condition of a people must come from impressions made or habits practiced during the training period of life. It cannot be concealed that our American population has in the last few decades shown deterioration in physical

vigor. In some cases it results from the overcrowding, incident to close city populations; in others it is owing to a want of active occupation in youth. Before the age of twenty-one there is more of idleness, or less, at least, of systematic labor and instruction in exact methods of work than formerly, and so less of incidental physical exercise. It is admitted that under our common school system there is need of a kind of education which shall more thoroughly fit young men and young women for the manual duties of life. From the ages of seventeen to twenty-one there is many a youth whose time is not profitably employed either in actual work, or in that kind of drill or education which shall fit him for useful labor. Often the young come to this age showing a lack of that vigor which, to those not endowed with wealth, is an indispensable prerequisite to success. Health is so much the capital of all work, that plans for its securement cannot be left out of our systems of education. As our school system comes to be examined, it is found not only that no proper attention is given to the teaching and enforcement of practical hygiene, but that children are subjected to influences such as are sure to unfavorably affect their vigor. It is evident that a system of public instruction in this respect is greatly needed. The advances made in the last twenty-five years, in our knowledge of physical laws, as applied to the human body, and in the study of the natural and artificial adaptations and aids to health, are such that it is feasible so to teach physiology and hygiene in the schools as that children shall come to know and to be trained to practice what is needful for their bodily welfare. They would thus become so acquainted with what is requisite for healthy ground, healthy dwellings, pure air, pure water, good food and proper clothing, as that they would know how productive and enjoyable life can best be maintained. To secure this kind of instruction it is not sufficient that some general advice should be given, or a book on physiology be studied a little, or that now and then a lecture should be given. The teaching and practice of hygiene must be conducted just as distinctly as is the exercise in grammar or penmanship, or in any other of the branches usually taught in our common schools. It should have especial prominence in the Normal School, and in the various cities and State Institutes in which teachers are being prepared for their work. We are glad to know that some of the city boards of education have realized this, and have taken measures for more thorough instruction and discipline of this

kind. The past two or three years have been very productive in text-books for this kind of instruction. If a thorough course could be given to the teachers of the State under skilled medical and sanitary direction it would result in a more thorough introduction of this branch of education into our common schools. This Board has a large collection of text-books in this line, and is glad to co-operate with local authorities in attempts to extend its teaching to all of our common schools.

Several of the States have passed laws requiring this kind of study and examinations in physiology as a prerequisite to certificates for teaching. It is not enough to boast of our systems of education if they do not aid in the physical and industrial, as well as the intellectual, and moral welfare of the population.

OUR CHARITABLE AND PENAL INSTITUTIONS.

The attention of the State to the condition of its charitable and penal institutions, although not yet what it should be, shows some commendable advance. In 1866, the State Sanitary Commission made some important inquiries into the care of the insane in county and township almshouses, as well as into the general condition of the houses and their inmates.

In the fourth report of the State Board of Health (1880), a valuable collection of facts was given as to almshouses and jails.

The sixth report, 1882, furnishes additional details as to this inquiry. The seventh report, 1883, still further illustrated the importance of a systematic oversight of these institutions in the interests of the State.

The report of the Bureau of Statistics of Labor and Industries (1883) has a very valuable article on jails, asylums and almshouses. We believe no one can read these series of reports without recognizing that both the health and industrial welfare of our citizens require a systematic attention to the condition of such classes of population. While it is hoped that the Council of Charities and Correction will secure a valuable oversight, the Board of Health and the Bureau of Industrial Statistics cannot but realize their necessary collateral interest therein.

The visits and inquiries which have thus far been made have shown the State institutions as having a much better management than most

of those of the counties and townships. While there has been some occasion to examine and advise upon the sanitary arrangements in these, it has been either when our attention was called thereto and advice asked by the managers or when some minor defects have attracted our attention.

The difficulties experienced as to the sewerage in the asylum at Morris Plains, have been under the advisement of the managers and of the State Board of Health, but the Superintendent of the asylum has been chiefly in oversight.

Both the old and the new asylumns at Newark have been visited, and some suggestions made. While we regard our asylum systems, taken as a whole, as seriously defective, and as not the best possible for health, occupation and recovery, it is not in the power or province of this Board to initiate any change of system. Especially in the county asylums is it the case that the lack of system, and of employment, tends more to confirm defects than to improve the patients.

Before the Asylum for the Deaf and Dumb was occupied, a careful examination was made of its sanitary arrangements, which, with very slight exceptions, were found quite in accord with the most approved modern methods.

The excellent executive ability of the Keeper of the State Prison has extended itself into careful inquiry and oversight as to matters of sanitary construction and administration. While the older parts of the prison are difficult to keep in good sanitary condition, chiefly by reasons of imperfect ventilation, the newer parts have many advantages which are well utilized.

The two penitentiaries of Hudson and Essex counties, which contain prisoners of short term sentences, are, in the main, well adapted for their purpose. As a whole, our jail system is defective.

This is all the more serious, since, as now conducted, they have social charms for the class who occupy them. By the present system, those who have been in them not only lose any self-respect they may have had, but find that the most comfortable disposition they can make of themselves is to do some petty crime, or get drunk, or become so vagrant that they secure commitment. They here are not only fed and sheltered, but have congenial company, and are too often educated into real or worse criminality. Our jails are thus made badly-managed almshouses, and do great harm to their inmates. We believe that the increased expense which thus yearly falls upon

our cities and our counties would more than pay for all the structural and administrative changes that would be necessary to break up this educational system for crime.

The sanitary conditions of the jails and of their inmates is not only bad for the jails, but a menace to the localities which they are in. It was their evils as pest-houses that first awakened the attention of the philanthropist, John Howard. The danger to health, and the even greater danger to the good order and peace of society, demands the earnest attention of our Legislature and of all good citizens, to all our charitable and penal institutions. As it has fallen to the lot of the secretary more than to that of any other citizen of the State to visit and study these institutions, he has reason, on behalf of this Board, to speak plainly as to the need of radical changes.

CHOLERA, AND PRECAUTIONS AS TO IT.

It is occasion for great gratitude that the cholera, which has caused such wide-spread desolation in Southern Europe, has not yet found foothold in America. Yet the history of past epidemics; the delayed but steady march of the invader heretofore, gives us a warning not to be unheeded. The transfer from Egypt to Southern France had a year of interval. With the rapidities of commerce and the frequency of inter-communication, it is not probable that the United States will escape invasion another year. If this were possible, the significant words of the distinguished authority in England, Mr. Simon, in 1873, are still of full weight: "It is important for the public very distinctly to remember that pains taken and cost incurred for the purposes of preventing cholera cannot in any event be regarded as wasted. The local conditions which would enable cholera, if imported, to spread its infection in this country, are conditions which, day by day, in the absence of cholera, create and spread other diseases: diseases which, as being never absent from the country, are, in the long run, far more destructive than cholera; and the sanitary improvements which would justify a sense of security against any apprehended importation of cholera would, to their extent, though cholera should never reappear, give ample remunerative results in the prevention of those other diseases. * * * The peril and the wrong of neglect is therefore not to be reduced by any consideration of a possible, although highly improbable, exemption; neither is it

modified by any increased hopefulness as to the successful treatment of the actively developed disease. Doubtless it is, still lamentable, that one should still have to speak almost with despair of the medical treatment of developed cholera; but so it is. The task continues to be, as from our first acquaintance with the disease it has been, an almost hopeless task to the practitioner. * * * Practically, then, more and more as facts like the above become notorious, the business of resisting cholera on any large scale resolves itself into aims of prevention. And in contrast with the powerlessness of curative medicine, the preventive power which we possess is among the happiest possessions of science."

The doctrine of the cholera-fungus was not new at the time of the former epidemic, and the probable discovery of the comma bacillus by Dr. Koch, while fulfilling expectation and very valuable, does not as yet throw any light upon the treatment of the cholera patient. It does, however, confirm former views as to the alvine secretions being the media of the contagium; also by the apparent fact that the bacillus is very short-lived if only it can soon be subjected to thorough dryness, makes more hopeful our success in preventing the spread of the disease.

These words, uttered in 1866, are still emphatically true:

"For public use in this country the all-important principle of cholera prevention is that 'cholera derives all its epidemic destructiveness from filth, and specially from excremental uncleanliness,' and 'the local conditions of safety are, above all these, two: (1) that by appropriate structural works all the excremental produce of the population shall be so promptly and so thoroughly removed that the inhabited place in its air and soil shall be absolutely without fecal impurities; and (2) that the water supply of the population shall be derived from such sources and conveyed in such channels that its contamination by excrement is impossible.'"

The Cholera Commission of the German Empire, which met in 1873 and reported about 1884, after nearly ten years of research and experience by the ablest authorities, united in this summary:

"'Of all the measures which may be applied to the prevention and combating of cholera, those take the first place which have for their aim the improvement of general sanitary conditions. All specific measures against cholera will prove unavailing, unless we pay the strictest attention in inhabited places to the purifying of the soil from

organic and easily putrifying refuse, to the drainage of the soil, to the constant flushing of the sewers, to the frequent emptying of cess-pits, the complete doing away with pervious cess-pits, the careful inspection of dwellings and closing those that are really hurtful, the provision of pure water both for drinking and other domestic purposes, and the like. The commission expresses here the united opinion of all, that the measures demanded by public, general hygiene offer the best protection, not only against cholera, but against all other epidemic diseases.'"

"Prof. Horsley, of the University of London, in his classic and experimental contribution, says: 'Where there is faulty hygiene and impaired vitality, there is consequent easy invasion by vegetable organisms.' Although the animal system is everywhere surrounded by these parasites, 'during health no vegetable organisms are found in the blood.' The particle-like moisture may be in the air, but the person and the place determine the manifestation. This dew of disease as a rule will not be found in the gravel highways of purity, but will drench with its death-sweat the fields and the bodies rich in the food on which it thrives."

How these results are to be best accomplished is the practical question of a wise forethought and foreact. Of how it was not done in the cholera of 1873, in a certain stricken and desolated town in which there was "great overcrowding and bad house construction; bad water-supply; bad drainage; absence of privy accommodation, and accumulation of surface nuisances," the following is the brief record:

"If a prompt assent and excellent resolutions would have cleaned the town, long before my inspection it would have been clean; but unfortunately it had not been deemed necessary to see to the *execution* of the orders given, or even, I fear, to provide the necessary force for carrying them out. There was no inspector of nuisances for this town of nine thousand inhabitants, devoting to that work, as the circumstances of the town urgently required, his whole time; but the inspection has been made to devolve upon an officer having abundance of other duties, and not especially fitted for this; the scavengering force was inadequate, and though there existed, or was believed to exist, a sanitary committee of the town council, it did not appear that they accomplished very much." The two great and embarrassing hindrances to the uniform administration of sanitary measures are either the absence of a properly organized executing force, or, if so organized, a defect in actual constancy and thoroughness of method and of the pecuniary means for its securement. Yet, the proper modes of

organization and execution are and have been in operation in the best sanitary districts, and there is no kind of work done for a city which there is so much true economy in having done well. And as to all threatening expenditures, it is needful to have in vivid remembrance the fact that "measures of cleanliness taken beforehand are of far more importance for the protection of a district against cholera than removal or disinfection of filth after the disease has actually made its appearance." Indeed, there is some limitation as to the removal of stored filth after the disease has located in a part of a city lest the act of removal may increase a danger which ought never have been allowed so to accumulate, and which will, if these words are heeded now, be removed in advance of any invasion of this State during the next summer. And because fall, winter and spring are so much the most seasonable periods for the removal, which in the case of many cities will occupy much time, it should be begun without delay. "The spread of cholera is generally in proportion to the density and want of cleanliness of the population among whom it occurs."

Besides that general effort for cleanliness, of which the details have been before noted in former reports, there are three to which especial attention should be given.

(1) There should be a careful examination into all sources of water-supply, and into any impurities to which potable water is exposed. Where there are serious contaminations, radical structural changes must be made; where there are not, the incidental sources of temporary deterioration must be watched and the remedies be clearly stated and applied.

Reservoirs and pipes may be greatly improved by attention this winter even, where the supply itself comes to them pure and wholesome. Often, where there is a public water-supply it needs to be accurately known how many houses and families depend on cisterns or local wells, and a record needs to be made, so that in any given cases of sickness or death any possible casual relation may be traced. Sometimes where the supply itself is not altogether satisfactory and new supplies cannot easily be secured, large settling and filtering reservoirs or the local filters of cisterns and house-supply are of essential service. It should also be understood that as a temporary resort, where the water is under suspicion and needing to be used, the boiling and pouring of it from one pitcher to another to aerate it, makes it a safe and a fairly palatable drink. Dr. Farr, in his report to the

Registrar-General of England, on the cholera of 1866, says: "The great explosions of cholera in England have arisen from the use of the water of tidal rivers into which the recent sewage of large populations has been poured."

(2) The next important measure is the prompt and thorough removal of fecal matter and excretions, whether of human beings or of animals, and of every sort of house-refuse or filth, wherever collected in the vicinity of dwellings. And that accumulations may not be going on in unseen places, or that befouled, or leaky, or air-locked or trapless pipes may not be a source of continuous deposit, careful skilled examination should be had by competent inspectors.

(3) As bodily and personal cleanliness and neatness, not only as to all bodily covering, including the skin, but also as to naturally healthful conditions within, have to do with susceptibility to many diseases, it should be known that improper foods and indulgences, bad air, and the special foulness of secretions caused by errors of diet or of life, are invitations to contagion, and that the system should be kept as thoroughly as possible in a natural condition.

In view of the possible invasion of cholera, or other foreign pestilence, there are a few preparations of another kind which need to be considered before its actual approach, since the knowing what to do and the doing of it promptly, as to the source of invasion, as to the person, or as to the house, lot, or vicinity, is often the determining point as to whether the first case or cases shall extend into an epidemic. This precaution, so far as this State is concerned, relates to (*a*) what guards are to be exercised against approach; (*b*) what facilities are to be provided and at hand for any first case or first house concerned; and (*c*) what are the more extended provisions in case of any actual increase of cases. In all this we of course take it for granted that there is now ready and equipped a local Board of Health, and that they have funds at command and will be promptly aided by such of their citizens as they may need to call to their aid.

We think that, in addition, all ports of entry in this State, and all Boards of Health of cities, counties, or townships bordering on the coast, should have similar authority to that given to the Board of Health of Perth Amboy, Chapter XIII., Laws of 1882, or probably, under the general law, may now exercise it. (See Chapter CLV., section 7, Laws of 1880.)

Some legislation should also be had by the State to provide addi-

tional appropriation in case of need. Also, because this State is a great entrance and exit of immense railroad travel and traffic, and because, especially in such epidemics as cholera, yellow fever, etc., cars and the closets and conveniences of railroad stations become chief sources of peril, there should be, on the part of the State or local officers, special charge of these. Such cases as this are on record. In 1873 a colored boy went from Lebanon, Kentucky, where cholera was present, to Columbia. He suffered from diarrhea, and at this latter place used a privy which was overflowed, but to which no sickness had previously been traced. He was found in a state of collapse, and died in a stable near by. The negro man in charge of the stable was attacked and soon died. Farmers who came in from the country, and only visited this privy once, were stricken with cholera. The privy was disinfected, after which no cases were traced to it. At all railroad stations and at all public resorts, the local Boards of Health should require the most perfect cleanliness and disinfection. The investigations of Koch, in the midst of the cholera in Egypt, India and France, seem to fasten the infection so singly to the fluids and excretions coming from the digestive and intestinal tract, that we cannot too thoroughly guard as to these, and as to direct exposure thereto. If the view of Koch is correct, that soiled clothing becomes infectious soon after it becomes soiled, it shows that all discharges should be received into vessels holding a disinfecting solution, or on disinfected cloths. When a patient comes under treatment, it should at once be inquired what privies or water closets have been recently used by him, and a person should be sent to disinfect if the place is within reaching distance. The duties of a municipal Board are so well summarized in a memorandum of the Ontario Board of Health, that we adopt it, with slight changes:

"The local Board of Health should issue and enforce directions for the immediate reporting of all cases or suspected cases of cholera, as of other infectious diseases, in compliance with the public health act of 1882.

"On receipt of such notices, the local health officers should immediately examine into the reports. If the medical attendant reports the case this will be sufficient verification.

"If the person has been taken sick at some public place, and needs removal, a metal ambulance with safety bed should be at command.

"The Board should secure the isolation of those sick with or exposed to the disease.

"Keep record and give notice of infected places, as far as needful.

"Attend more carefully to the relief the poor.

"Regulate as to funerals of persons dead from the disease.

"Cause rooms, clothing and premises to be properly disinfected.

"Give certificates of recovery and of freedom from liability to communicate the disease.

"Every person known to be sick with the disease should be promptly and effectually isolated from the public. No more persons than are necessary should have charge of the patient, and these should be restricted in their intercourse with other persons. The children of the family and other inmates should be prevented from mingling with others in schools or other places until the period of incubation of the disease shall have passed.

"Notices may be placed on the house in which a case of the disease exists, and no unnecessary persons allowed to enter.

"Boards of Health should have distributed in every house copies of the instructions to householders and private individuals as herein contained, or others of a similar nature, and should see that the same are carried out. [See Circulars of this Board.]

"In populous municipalities isolation hospitals should be provided just as soon as intelligence is received of the existence of cholera on this continent. These hospitals, if happily not required for cases of cholera, will be a useful investment for cases of small-pox, scarlet fever, or diphtheria, constantly occurring. In less populous districts they may either be portable, or may be rapidly constructed on the nearer approach of the disease, or if required for other infectious diseases.

"In populous districts reception buildings should also be established for the reception of persons not actually attacked with cholera, but who require to be kept under observation least they should become fresh centres for spreading the disease. Such persons should there be provided with clean clothing, allowed to prosecute some daily avocation, and be kept under observation fourteen days.

"The local Board of Health should provide a public laundry and disinfecting house, otherwise the infected clothing may become a ready means of spreading the disease. Metal vans or carts disinfected or holding disinfecting fluids should be provided for carrying foul clothing. Former circulars give directions as to disinfection. Sulphur cones which can be lighted by a match are convenient for disinfection of vessels, closets, etc., or to set on fire larger quantities of sulphur.

"If it be found that carelessness exists in carrying out the precautions recommended regarding funerals, some officer or officers should be detailed by the local Board of Health to see that they are so carried out.

"It must be borne in mind by local authorities that want of the necessities of life and of medical attendance and medicines favor the spread of the disease and increase mortality, and that such wants are

more apt to occur during a time of epidemic, when bread-winners may be prostrated or waiting upon those who are attacked.

"Local Health Officers should make notes of the source of any case which may occur in their locality, and of all other facts likely to be of service in a statistical point of view, or in the future study of the disease, and its prevention or limitation."

One of the earliest duties of a Board is to pass an ordinance requiring the immediate report by the physician, or other person in attendance, of any case of suspected cholera that may occur.

Each Board of Health should, in advance, have a full plan as to what shall be done with any case of cholera reported, whether as occurring to a person not a resident but passing through the district, or to a resident in some house within their jurisdiction.

The questions that arise are, Shall there be removal? If so, where? How are medical attendance and nurse care to be secured? The question of removal, except in the case of those taken on the highway, or in some public conveyance or station, is a relative one. If the case occurs in a good locality, where the family can command the best of attendance, the duty is to choose, if possible, a high, airy room, to divest it of all unnecessary clothing or furniture, and by means of fire-places or open windows, with wire screens, to secure pure air without draft. The nurses, as well as patient, must be isolated from others as far as possible, lest by garments, etc., they convey the disease. Details as to the management of the sick-room, use of disinfectants, etc., are given elsewhere. But for other cases which are likely to occur in unfavorable localities, there should be no delay in providing isolation hospitals. This Board is prepared promptly to furnish plans for any such hospital.

The desirability of removal to a hospital is always a relative question, but experience has shown that there is less risk in the vacating of an infected spot than in the transfer, if only the transfer is conducted with systematic precaution.

A cholera ambulance, of metal bottom and sides and well disinfected, and its air kept charged with a disinfectant, and with the transfer in skilled hands, is not so likely to cause spread of the disease as the locality itself, which, being cleaned, can be fully and promptly disinfected.

Emergencies arise which sometimes require that a building already infected, and not of the best location, be at once converted into a hos-

pital, the disadvantages being overcome, as far as possible, by scrupulous care and disinfection.

It is of great importance to organize, in an increase of the cases, a medical corps, ready on call, and especially to have at hand efficient nurses, under directions. These can only be had when arranged for in advance. So much depends, not only to the patient concerned, but to entire communities, on the prompt and efficient handling of the first case in any new locality, that this kind of preparation is indispensable. It makes a great difference whether we start to put out a fire an hour after it has begun, when we might have started with the first blaze.

Another matter of great importance is not only that proper directions be given as to management, but that some one in general oversight see to it that they are efficiently carried out. Nothing, for instance, is more common than "dabs of sanitation," or than to "play disinfection." Most of disinfection amounts only to a quieting of the mind. But real and competent disinfection is very successful and of the greatest importance. Methods and the choice of materials are well understoód. These are fully given by this Board in Circular VIII., Sixth Report, 1880, Circular XLIV., as to Communicable Diseases, and in the Cholera Circular XLV., and to be had on application to us by postal. To the disinfectants there named, three others may be added: first, corrosive sublimate, in the solution of one ounce to eight gallons of water, is of great value, to be sprinkled about, or to be placed in water-closet utensils, sinks and cesspools, or for soakage of clothing, towels, bedding, or other textile fabrics. As it is a corrosive poison, it must be under the direction of the nurse or physician. Second, commercial sulphuric acid, in the proportion of one pint to eight gallons of water, is very valuable for the same surposes and used in the same way.

As a pleasant and efficious wash to be used around or upon the patient and for personal washing of hands, face, etc., the following solution of crystals of thymol is advantageous:

Two drams of thymol, dissolved in ten drams of alcohol, twenty drams of glycerine and one gallon of hot water, kept in bottles. These are named because they are important additions to our former disinfectants. Our own choice is as follows:

For Washing the Hands and Other Parts of the Body.—Thymol, or

chlorinated soda (Labarrague's solution). If these are not at hand, zinc chloride or lime chloride.

For Utensils Used.—Iron sulphate (copperas) solution, one and a half pounds to gallon, or sulphuric acid, one-half gill to one gallon of water.

To Place Clothing In.—Zinc chloride, one-sixth of a pound to a gallon of boiling water, or, in safe hands, one ounce of corrosive sublimate to eight gallons of hot water.

For Sprinkling or for Washing Furniture, etc.—Solution of corrosive sublimate, as above, or the zinc chloride solution.

For Fumigation of Rooms or Out-Houses.—Burning sulphur (see circulars), or the fumigating cones, mostly of sulphur, and easily lighted by a match, can be used instead.

For Scrubbing Floors.—The warm corrosive sublimate solution, or sulphuric acid, or carbolic acid and water, or the iron sulphate (copperas) solution.

For Disinfecting Privies, Secretions, etc.—The same.

In case of death, roll the body in a sheet saturated and wrung out in a solution of the corrosive sublimate, or copperas, or zinc solution, and await the undertaker, who is presumed to be acquainted with all the methods of rendering the body and the coffin safe for transportation and burial.

Precautions to be taken by Individuals.—During a period of cholera or its threatening, there should be especial caution as to all that relates to a good physical condition.

Undue anxiety or fear undoubtedly seem to make the body more receptive to disease. Precaution can do great good, and fright great harm. If the cholera is in your district, be sure that all water used by you is good; if not, have it boiled or use it as in tea or coffee. As to milk, boil it or know its source of supply, as beside its own possible contamination, the cans may have been rinsed with water which was impure. Alcohol in bad water does not make it pure, and the free use of it or of beer is not favorable to the best health. Such good fruit and vegetables as have been found generally to agree may still be used, but none that are unripe, imperfect or half decayed. Meats should be well cooked, and much care should be taken as to their quality.

Exposure to extremes of heat and cold, and in moist, hot weather, and late hours and loss of sleep, should be avoided. Clothing of

flannel next to the skin is needed. Regular life everyhow is the rule. Directions as to cleanliness of locality have already been given. If you are in an unhealthy house or locality, move from it in time if you can; if not, put it in the best order possible. As cholera is chiefly, perhaps entirely, conveyed by discharges, use no public closet, or if compelled so to do, carry with you some such disinfectant as is recommended for closet use. While physicians and nurses who know what precautions to use and use them are not more liable to the disease than those not in attendance, yet all who are not needed to care for the sick should avoid exposure. Food or water which has been in the room of a cholera patient should be disinfected and thrown away. No one should eat in the room. Persons who need to visit the sick are wise to brush the hair and wash the face and hands with a disinfectant on leaving the room, and they need not to be nervous about the disease. All clothing and utensils in the room are to be looked upon as possibly liable to be soiled and so to be media of communication of disease. Avoid all second-hand articles, clothing, etc. It is believed by many that five drops of aromatic sulphuric acid, in water, taken before and during exposure, and that the presence in the mouth or system of quinine, arsenic, and some other medicines, and their constant moderate use during epidemics, is protective. If diarrhea occurs, at once attend to it as directed in Circular XLV., and until you get a physician use every half hour, if discharges are so frequent, the doses therein named for adults. If unable to purchase medicine, report very promptly to the dispensary. If possible, assume and keep a recumbent posture. The moderate use of mustard-plasters and a bandage of flannel over the bowels, a little medicine ready for any attack of diarrhea, prudence in food and drink, and a quiet spirit, cure many cases of so-called cholerine. So important and effectual is this early attention that in cholera countries intelligent persons generally carry with them some temporary remedy for any bowel disturbance that may threaten. There is no need of panic over single cases. In four late epidemics (1877–8–9–80) in India, there were 154,986 villages attacked. In 58,972 of these there was only one death, and in 20,596 only two deaths. Yet the fact that in these years the total mortality was 1,380,226 shows how fearfully destructive it is when it finds all the requisite conditions, or is not guarded by efficient sanitary police. This of itself shows that some other facts than its accidental arrival determine its virulency. These facts are

generally local filth, personal filth, overcrowding, and the absence of an efficient sanitary administration ready to act forthwith—which means knowing beforehand what to do, and having been provided with means to do it. While certain climactic conditions may still frustrate our efforts in part, yet our only safety is in thus using the means which all are now agreed greatly tend to prevent epidemics or to restrict their extent and virulency. While recognizing our need of looking to a divine Providence for aid, it is chiefly by obedience to natural laws and by seeking guidance in the use of proper means, and by using these means, that pestilences are to be prevented or stayed.

LOCAL BOARD OF TOWNSHIPS.

The importance and usefulness of local Boards of Health is constantly receiving illustration in the correspondence and experience of the State Board. The fact that here and there inefficient Boards are to be found, that even good Boards do not at once or every time succeed with what they attempt, and that local or personal opposition is sometimes aroused, proves nothing more than we find to be true of most salutary laws. Many of our Boards have outlived the times of indifference, and are now looked to as great conservers of that inalienable right which every person has to be protected from avoidable menace or injury to his health, whether resulting from the neglect of the city authorities or from the unsanitary condition of some person or premises.

The powers given to the township Boards of Health are even more complete and satisfactory than those possessed by city Boards, since with the latter there are sometimes collateral or conflicting powers of other Boards, or of the municipal governments, that have to be explained, understood or adjusted. Each township Board, if efficient, can abate nuisances, put in operation laws as to drainage, etc., and secure a complete registry of marriages, births and deaths. Where there is an uninformed public opinion, they can do much to enlighten, and will find this Board ever ready to aid. By the present law they are allowed to spend fifty dollars a year without a direct vote of the township, and the township committee may, in their judgment, vote more, or order the payment of bills exceeding this. It would be well to raise the amount to one hundred dollars, since no Board is so likely to be economical as a local Board of Health. On the other hand, it

is often easy by factious opposition, or an honest ignorance as to the necessity of their action, to curtail their usefulness by leaving them without funds. While we are most conservative in view as to the degree to which the State should direct as to local expenditures of money to be raised by localities, yet, as in many ways the State gives local aid, it also is entitled, for the avoidance of general peril, to require some local sanitary care. It is claimed by some that all members of local Boards should be paid. This is not claimed as to Boards of School Trustees, and it seems to us that it is not unreasonable to expect that some citizens will be found enough interested in this great concern to show their interest by personal and gratuitious attention. This, however, is not to be expected where, as in epidemics or in villages or localities needing special investigation, an inspector or other officer needs to be for a time employed. Many assessors have rendered valuable gratuitious services by inquiries or information. The State permits this Board to aid, to a small amount, local Boards where any special investigation seems to come under the design of the law.

BOARDS OF TOWNS AND CITIES.

Many of the town and city Boards have done effective service. Others are embarrassed by the fact that the municipal authorities consider it their function to enforce a so-called financial economy by restricting the amount to be expended for sanitary purposes within paltry limits. We were sorry recently to notice the great contrast in this respect between our own municipal corporations and those of Great Britain, in which the financial and economic value of Health Board sanitation has been fully tested. A Health Board is there looked upon as so far by courtesy and right supreme in its own particular line, as that its budget of what it regards as necessary outlay is the one rarest of all restricted. Some of our cities still have Boards of Health which, whatever they may be called, are but committees of council to which, in one or two instauces, two or three outside members have been added. While charters give power to form Boards of Health and pass ordinances, it seems to be overlooked that in order to enforce ordinances, most of which partake of the nature of police law, there must be statutory enactments and provisions, and exact specifications of methods of enforcement and penalties that have been provided by the State government.

There is also the fatal objection which thought would suggest. Experience has demonstrated that where a Board of Health is thus formed and is necessarily subject to every political change, it cannot have that prudent independence of action needful to the effective sanitary administration of a city. If faithful, it must come in direct opposition to nuisances in which the pecuniary interest of owners is involved. These are generally able, in the end, to rout any faithful sanitary officer directly dependent on political preferment, while the popular ones are those who make a great stir in abating certain kinds of nuisances among those too poor to resist, and do nothing as to others. They seldom *prevent*, and have not that relation to the office which leads to a close study of sanitary art and administration. So signal is the experience in such cities as New York, Brooklyn, Boston, Milwaukee, Detroit and the like, that they have been careful to draw plain lines of separation, not because the chief functions of municipal government should not inhere in the mayor and common council, but because their interest, and a great public interest, requires that the care of public health and the power to deal with the most flagrant causes of disease and the nuisances that are rapidly disease-breeding or death-dealing, should have expert ability, aided by thoughtful citizens who have paid special attention to these matters, and who can execute such laws with a propriety and freedom from embarrassment which cannot be obtained by an ever-changing Board. The law of this State, therefore, has provided for Boards, which, while deriving appointment from the municipal authorities and quite sufficiently under their control, are yet not subject to complete change at every change of administration—only three being allowed to go out at any one time. These have such legislative acts behind them and such conferred standing before the courts as will give effect to ordinances. While we shall not fail to assist as we may even those trammeled Boards which have valuable members and succeed well with those so docile as to yield, or so poor as not to contend, we cannot admit a principle of sanitary government which, in the last fifteen years of sanitary legislation, but one city in America has sought to revivify.

For effective sanitary administration, large powers must be conferred, as in both police and military offices. Men who, because power is given, think that the power must be turned on every time and equally on everything, are never fit for such places, and as soon find their limit as would an engineer who thus dealt with his engine.

On the other hand, any city so conservative on such a matter as the cleanliness and the health of the people that it forms its Board on a system of inherent disability, cannot expect to get along fast in preventing disease and lowering its actual sickness and death-rate. Nor will it, in the long run, flourish in growth and in business. Most of the value of Health Boards depends upon their completeness of organization, their conception of the work intrusted to them, the support of the more intelligent public opinion, the absence of partisan interference, and a proper reliance upon and confidence in the judgment of the Board as to the amount needing to be expended. Their chief duties are summarized in Circular XXXIX. of this Board. No cast-iron rule of procedure can be devised suited to each case. Often the first work is that of instruction. Next, it is to enforce such surface cleanliness as commends itself to good taste, to ordinary neatness, and is for the general interest of every community. It is rarely that a system of spring and fall inspection of premises can be omitted. Suggestions on the part of the inspector are often needed, and, in flagrant cases, the attention of the Board. In a well-cared-for town, the health officer, by reference to his books, or those of his predecessor, is able to tell the underlying soil of each street of the town; the depth of each cellar or basement, and such as are continuously or occasionally very damp or have water in them; the usual water-level in the ground, and the best modes of local drainage where it is needed; the source of the water-supply of each house, and its quality and condition; the position and distance of the water-closets or privies or of any cesspools, and their construction; the places for refuse; the modes and times of removal; the disposition made of garbage; the condition of all house-pipes, or their modes of connection with outside receptacles; the construction of the house as to material, and as to the arrangement of its various pipes and fixtures. He can refer to the record as to the number and causes of death that have occurred in any house for a series of years, or to cases of sickness, with explanatory notes as to them, together with various other items to be taken into account. We outline briefly such a model, not because most will live up to it, but because some communities, especially in Great Britain, have shown how it is possible to keep full account with the health and life interests of citizens on a business basis, and to reap the rewards in prolonged life, in deliverance from sickness, and in that prosperity which is oftenest the outcome of such care.

The one great need of most villages and cities is a really competent health inspector, who, himself, will be able to secure the removal of many evils, and the prevention of many others. Where there is need of complaint, the Board should make it in a formal way, and ask the owner or tenant to abate. If not attended to it is generally better to notify the party that at a certain time and date a magistrate will be asked to issue order for abatement. This is not of the full nature of a trial, since proceedings, which are summary at the start, are allowed, on the ground of impending evil, on the ground that at such a stage, and before the lower courts, questions of this kind are not likely to meet either a speedy or correct solution before a neighborhood jury. The Board, being more responsible than any individual, is answerable in future inquiry if it shall prove to have been unjust, which is so rarely the case.

In other cases, the matter is taken before a grand jury for indictment. In some instances both methods have been followed with effect.

Several Boards have availed themselves of the more summary proceedings provided for under the supplement to an act entitled "An act relating to local Boards of Health," approved March 22d, 1883, especially sections 10, 11 and 12 of the same.

While the common law is very wide in its definition of nuisances and claims that even what is constantly so unpleasant to the ordinary citizen as to render life uncomfortable, may be a nuisance without having been shown actually to have caused sickness, yet Boards should be careful not to yield to captious complaints on the one hand, nor to be deterred from action as to pronounced nuisances on the other. It is not because there are no remedies at common law that special acts are passed, but because sometimes its methods are not summary enough, and also because many citizens are too poor or uninformed to be able to secure relief, and have a right to the municipal or other official defense of their health, which it is the prerogative of the State to grant, and which it thus confers upon Boards of Health. Two or three recent decisions in the Court of Chancery are of much importance in further interpreting the health laws of this State. The first, was the case of the Health Board of the city of Trenton, against the proprietor of the American House for sewering into Petty's run.

The case was vigorously contested on both sides, and had long and patient hearing from Vice Chancellor Bird. Besides some efforts to

invalidate the legality of the laws of the State, it was contended that there had been informality in the organization of the Board of Health, and that the former permission of the common council to sewer into Petty's run was of the nature of a contract. Omitting such points as had reference to the special Board, we quote as follows:

"The defendants urge that the manner in which they use this stream to carry away the hotel filth, is not a nuisance, and in no way hazardous to public health. In this respect, as the testimony stands, they are mistaken. The great, the decided preponderance of testimony, is against them. Whatever conclusions may be reached from isolated facts, when these facts are presented in a body they carry the mind at once to the conviction that the defendants are doing violence to their neighbors and fellow-citizens.

"It has been pressed upon my attention that many others are equally, or more, guilty. This I cannot consider. I allowed some testimony on this point, not because I thought it admissible, but that the defendants might be heard above, if I should be in error. I think each one is separately liable for the nuisance to which he contributes. It is no shelter to the one charged that another may have aided directly or remotely, or otherwise.

"Again, counsel insist that this Board of Health has no authority to prosecute; that it has not shown itself to be within the statute. It is urged that, being a special tribunal, created for special purposes, and clothed with definite powers, it must prove that it has walked according to the line prescribed in every particular, and that any departure is fatal to the entire work undertaken. This admits, however, and so the counsel frankly stated, the legal existence of the Board of Health in the city of Trenton.

"But the power or right of this Board to institute proceedings in this court is denied. It is denied that the Board of Health referred to in section 9 of the act of 1883, (Public Laws, 1883, page 122,) in any sense includes the Board of the city of Trenton. That section declares that any such Board of Health, instead of proceeding in a summary way to abate a nuisance, or such source of foulness, may file a bill in the Court of Chancery. It will be observed that it says any *such* Board. If we follow the ordinary rule, we will look for the antecedent of such. This we find in the section immediately preceding (the 9th). That section provides that whenever any Board of Health now organized, or which may be hereafter organized, under the laws of this State, as referred to in section one of this supplement to an act entitled 'An act relating to local Boards of Health,' approved March 22d, 1881, shall be notified that a nuisance or other source of foulness, hazardous to the public health, exists within the territory within which the Board of Health has jurisdiction or control, such Board may examine the matter in a summary way, and order and cause the same to

be abated.' Now when the words 'such Board may examine the matter in a summary way,' are looked at in connection with the words, 'that any such Board of Health, instead of proceeding in a summary way,' &c., in the very next (10th) section, which gives the authority to sue, it will be found, I think, beyond dispute, that the antecedent to the phrase *any such Board*, in the latter section, is found in the one immediately preceding, in which, and in which only, is used the additional phrase, 'summary way.'

"Hence, of course, the inquiry: Does section 9 of the act of 1883 comprehend the Board of Health of the city of Trenton? I think if it does not it has no right to come into this court. Let us attend to the language of that section. It says, whenever any Board of Health *now* organized, or which may be hereafter organized under the laws of this State, as referred to in section one of this supplement, being the act of March 22d, 1881, (Public Laws, 1881, page 160.) It says, as referred to in section one of this supplement, and section one refers to the act of March 11th, 1880, and to a supplement of March 31st, 1882, and also to the act of March 22d, 1881. So that, most evidently, the Boards of Health which may proceed in a summary way, mentioned in the 9th section of the act of 1883, are any and all such as are authorized by either of the acts above named.

"Is the relator such a Board? Again let us attend to the language of the law. The first section of the act of 1880 (Public Laws 206) reads: 'That any city or borough, or incorporated town, or any town governed by a commission, shall have a Board of Health of not less than five, or more than seven members, of which the keeper or recorder of vital statistics, and also one city physician and city health inspector, shall be members, if there be such officer or officers; and the said Board of Health shall be nominated by the mayor and approved by the common council, or other governing body of the city, borough or town, to serve for not less than three years, but not more than three of the number shall go out of office at any one time.' This section declares that every city shall have a Board of Health. But it is said that such Board does not come within the purview of the section last recited. The claim is that this Board is the creature of the common council of the city, and that it has not and cannot have any other paternity. It is said that the council solemnly and formally organized and established it. It is true that July 11th, 1882, the council did, in the name of the inhabitants of the city of Trenton, ordain that there should be a Board of Health established in the city of Trenton, and that the same should be organized in accordance with the provisions of an act entitled 'An act concerning the protection of the public health, and the record of vital facts and statistics relating thereto,' approved March 11th, 1880, and the supplements thereto. From this it would appear that the council only intended to bring the case within the act referred to and its supplements. This ordinance required the mayor to nominate men as members of the Board of

Health, and to send such nominations to the council for its approval. The first section of the act of 1880 requires the mayor to nominate members of such Board and the council to approve of such nominations. The mayor made such nominations and the common council approved of them. All this purports, on its face, to have been done by virtue of the authority conferred by the act last cited.

"In my judgment the law was substantially complied with. The statute says that said Board of Health shall be nominated by the mayor and approved by the common council. It did not require any ordinance. No preliminary steps are demanded by the statute. The first movement contemplated is the nominations by the mayor; and the second, the approval by the common council, both of which were taken effectually in this instance. Nothing else that was done could add to or detract from, either the nominations or approval.

"But, now, the nominations being made and the approval given, it is urged that the prescribed statutory line has been departed from, in the nominations of the health inspector and the physician. The statute declares that one of the city physicians and the city health inspector shall be nominated as members of the Board. Therefore the mayor had no choice. To this extent the legislature made the selection. It is said one of the members must be one of the city physicians and one the health inspector. And this brings us to what is regarded as the fatally weak spot in this branch of the complainant's case, that is, that although the health inspector and one of the city physicians were appointed, their appointment was a nullity, in this case, *because the period of time for which each of them held such office, or could hold such office under the city charter, was only one year, while the first section of the act directing the appointment expressly says that said Board shall be nominated 'to serve for not less than three years.'* Shall a beneficent public work, set on foot by the representatives of the people, fail in its mission because of this seeming irregularity? I feel myself bound to construe the act favorably to the relator. The public are deeply interested; this is made most conspicuous by the title of the act and every line which follows. I must regard the object to be attained or had in view by the legislature, viz., the preservation of the public health. (Sedg. on Stat. Construc. 193). In matters between individuals arising under the statute of frauds, it has been repeatedly adjudged that the act should receive a liberal construction. 'It should be so construed as most effectually to meet the beneficial end in view and to prevent a failure of the remedy.' Potter's Dwarris Statutes 73 and 231, approved by our Court of Errors in Randolph *v.* Larned, 12 C. E. G. 560.

"And there are, I think, some authorities which bring the view as to liberal construction, where third persons or the public are concerned, still nearer in relation to this case. I refer to Perth Amboy *v.* Smith, 4 Harr. 52, 56 and 57. In that case an overseer of the poor had neglected to take the oath of office, but acted as such officer. The

court held that he was overseer *de facto*. Hornblower, C. J., declared that such was the law. 'In those cases where the public good imperatively requires an act to be done without delay, and where individuals have rights *ex debito justitiae* against the public or other individuals which would fail for want of a public functionary to act in the premises.' Hoagland *v.* Culvert, Spencer 387; State *v.* Perkins, 4 Zab. In this case the members of the common council, who had not been legally sworn as such, imposed a tax, the collection of which was resisted on that ground; but the court said: 'That the acts of officers *de facto*, in which other parties or the public have an interest, are valid.' State *v.* Tolan, 4 Vr. 195, 201; The People *v.* White, 25 Wend. 525. 'A clerk of the court, appointed by a judge *de facto*, is well appointed, and may hold his office though the judge be ousted.' People *v.* Staton, 73 N. C. 546; see, further, Savage, Receiver *v.* Ball, 2 C. E. G. 145; Angel & Ames on Corp., Sec. 287, and Bac. Abr., Title Officers, Vol. 7, 283.

"Believing that the object of the Legislature was to achieve some public good, and it being undisputed that officers named were nominated and approved, and that they have acted as members of the board of health, with the numerous cases above cited and referred to before me, there seems to be nothing left for me to do but to regard the objection to the relator's right to sue, because the city physician and health inspector had not, under the city charter, terms of office of three years' duration as untenable. If this objection were to prevail, it would only be by chance that any city could claim the advantages of the act. Every city must not only have the power to appoint such officers for three years, but they must actually make the appointment contemporaneous with the appointment of the board of health, for the loss of a day or a week would as effectually bar as two years. If time be the important principle, its extent or duration must be wholly immaterial.

"I conclude, therefore, the relator is such a body as is contemplated in the ninth and tenth sections of the Act of 1883.

"The counsel of defendants think the proceedings should fail, because the Act of 1881 is unconstitutional. In my opinion the arguments adduced do not reach this case.

"I think the relator was justified in filing the bill. I think the discharging of water-closets, and the like, of the defendants' into Petty's Run, through the pipe named and described in the bill, is a nuisance and hazardous to the public health, and should be abated. I will so advise. The defendants ought to pay costs."

In two other cases—one on behalf of the Board of Health of Lambertville, and the other in behalf of the Board of Health of Bridgeton—parties have been in like manner restrained from the pollution of streams so small as to cause a public nuisance, and in one of the cases affecting the water-supply.

It is evident from cases that have occurred in other courts, that where the facts of nuisance are clearly made out, and there have been no vital errors as to mode of procedure, the series of State health laws is fully sustained.

CEMETERIES.

In the last report of this Board, an able and careful paper on "Interments" presented the reasons why the custom of interments within city limits should cease, and why, also, in townships and near villages, the habit of allowing companies to locate cemeteries without any regard to the approval of Health Boards could be no longer tolerated. Various facts as to graveyards and cemeteries in different parts of the State make it certain that water is often polluted from such causes, and that the air is fouled by exhalations from overcrowded burial grounds. Often spots are chosen without any reference to the relations of dwellings and without proper regard to soil or underdrainage. Since the paper was written, the developments made by the township committee of North Bergen township, in Hudson county, have given great emphasis thereto. They have shown that the five cemeteries of the township have polluted both the air and the water; and that the irresponsible manner of conducting burials, as well as the localities of these cemeteries, has made them a menace to the health of adjacent cities and to the immediate township concerned. Burial has become a commercial industry, so that commercial travelers solicit patronage and secure profits that are large. Success is based upon having the cemeteries of very easy access to cities, and upon the placing of many coffins in the same grave or in the same small plot. On the Weehawken side and Palisade, of the joint cemetery, twenty-eight graves were examined. In five, the top of the box was from eleven to twenty-two inches below the surface; eleven from twenty-five to thirty-eight inches, and nearly all the others less than four feet. Hoboken Cemetery, in about twenty-two graves examined, had seven less than three feet, and the most of the rest less than four feet. In the pauper part "they bury four bodies in one grave." Grove Cemetery, in seventeen examinations, had none as deep as five feet, and most less and four feet. In the burying ground on Snake Hill, in about thirty-two measurements, the depth from the surface of the ground to the top of the box was three and a half inches or less in four cases; from four to eleven inches in ten cases; from twelve to

twenty inches in eleven cases, and but one in the whole number more than twenty-six inches. Much of this probably arises from the plan of putting more than one body in a grave. While these are no doubt not specimens of what universally prevails in cemeteries, it is true that there is need of some more accurate legislation as to cemeteries and burial grounds, so that they shall not endanger the public health.

DISEASES OF ANIMALS.

Each year the study and care of the diseases of animals has increasing importance both because of the immense amount of capital invested therein, and because of the relation they have to the health of the people. Indeed, the light which their comparative study has thrown upon many diseases special to mankind makes some knowledge of them almost indispensable to studies of the causes of human diseases.

Several animal diseases are common also to men, some are inter-transmissable. Scarlet fever is now claimed to have been recognized in the horse, and students of minute animal and floral life are very closely studying the natural history of other communicable diseases as related to various species. The whole subject has received a new impetus from the apparent discoveries as to the relation between human and bovine tuberculosis. While we must still await the accumulation of facts and their closer analysis, it is significant that so many careful observers believe in the identity of the two diseases, and also that consumption or other forms of tubercle found in children or older persons is often due either to the milk or meat of tuberculous animals.

We have had occasion the past year to deal with a very valuable herd in this State, in which some of the cattle were affected and had to be slaughtered. The Board was able to settle an important dispute as to diagnosis, and to remove the suspicion of a still more formidable disease. Tubercle, as found in animals, does not so generally affect the lungs as in man. It is more apt to show itself at parts of the peritoneum below the diaphragm and in the mesenteric glands. Sometimes cakes and pearl-like bunches of abnormal growth or deposit are attached at various points on the interior abdominal walls, or to the liver or other organs. The udder is occasionally, but not very frequently, involved. We have seen the carcass of a large, fat cow

so filled throughout its lining membranes with this deposit and the meat so dark and mottled as to show utter unfitness for use. Such meat is always condemned at once in the English market. Where any such has come to our knowledge we have advised that the meat be buried, but no law of the State gives authority as to it. There is some difference of opinion as to whether the milk from tuberculous cows will convey disease. While all admit that it is of poorer quality, yet most do not believe that it will directly impart the tubercular condition, unless the udder or milk gland is itself affected. This a careful examination will usually reveal. As to whether a tuberculous cow will impart the disease to another, there has also been some question. The opinion is fast gaining ground that one tuberculous animal in a herd is likely to infect others. The progress is slow, and those nearest are most liable to attack. Cases reported by the veterinarian of the Bureau of Animal Industry, at Washington, as well as those known to us, seem to give strong probability to what is now a much more common belief than formerly. Tuberculosis is greatly on the increase in Great Britain, and to some extent in this country, especially among Jersey cattle or other select high-bred stock. This affords another evidence of how important it is to have all such diseases under careful observation.

During the past year we have had some opportunity of seeing cases, and specimens of foot and mouth disease, which, happily, has not yet a foothold in this country. But its frequent occurrence in Great Britain, and the great loss it has occasioned, cannot make us too watchful.

Contagious pleuro-pneumonia has required the most watchful attention on the part of the Board. Several outbreaks have occurred, the details of which are to be found in the report of the State Board of Agriculture. We have had continued evidence of the good results of inoculation in those herds where immediate slaughter of the sick has not stayed the disease. But the wisdom of the law, which requires that it be only done by the permission of the State authorities, has been illustrated by important cases which have occurred in unskillful hands, or to those not having knowledge of the law. We still hope, and expect to hold the malady in check, but shall never fully eradicate it so long as border States have ineffectual laws, or the general government fails to protect us from its incursion. Some recent examinations by the U. S. authorities in this State have aided us in our work.

Pneumo-enteritis, or the disease known as hog cholera, has caused

heavy losses in Gloucester, Burlington, Mercer, Union, Warren and other counties. While no new facts have been developed as to the treatment, it is yet true that farmers who have clean pens, and who, at the very earliest moment of an outbreak, or when it appears in their neighborhood, at once remove the stock from the old pens, and furnish new pails, hog troughs, etc., meet with less loss. Small doses of sulphur, of carbolic acid, or of the bisulphite of soda may be of some service to animals not yet sick. For those sick, immediate slaughter, and four feet burial are the remedies; valuable because thus there is a better prospect for the rest of the herd.

Texas cattle fever, and the disease of calves known as Husk, or Hoose, has also required some of our attention.

The duties of the Board, growing out of the new law as to glanders, made it incumbent upon us to deal with promptness with the outbreak in the South Orange car stables, as also with an isolated outbreak in Hunterdon county. At one time various embarrassments were interposed to the enforcement of the law. It was not until the 20th of August that we were able to remove the quarantine near Newark. While in so insidious a disease it is difficult to insure immunity, yet it was gratifying to secure the result attained. A defect in the law made it necessary to charge most of the expense to the general appropriation for the contagious diseases of animals.

The duties of the Board, in oversight of the contagious diseases of animals, have taken a wider range this year than before, and shown the law, as in its main features, facile and effective. While admitting of some minor improvements, it is now the best law of the kind on the statute books of any of the States. In duties arising out of the law, and also in those bearing on the public health, we have too frequent occasion to notice the number of stables, cattle-sheds and pens left in a filthy condition, the dirty surroundings amid which milk is gathered, the careless handling of utensils, the unfitness of many places where the animals are slaughtered, and, in general, a laxity of care as to cleanliness, and as to the meat and milk-supply, entirely inconsistent with the best welfare of the people. The use of malted grains and the high demands for milk produce, have induced many dairymen to locate within city limits. It is essential that all our cities adopt a plan of registering all animals kept in city limits, and that they require an inspection of stables. There is great need, too, that more public abattoirs be established. Only thus can there be riddance from the

many slaughter-house and pen nuisances, and a system of inspection of meats, such as is essential to a good meat-supply. Different grades of meat must, of course, be allowed, but when the veterinarians find lame and sick animals being killed in private shambles, diseased livers and lungs being hidden away lest they should betray the condition of the animal, and uterine calves being removed and dressed for tender veal, it is high time that our cities should take action as to the matter. We do not refer to these as very common, but we do find evidence that, especially in large cities, a great deal of meat unfit for food is on sale. Dr. Farr alleges that boils, attributed to other causes, often result from such food, as well as some skin diseases. There are many degenerations of blood and tissue not specific, or causing specific diseases, but, nevertheless, taxing the vital forces of the system in its necessary effort at riddance, and so depressing the system or endangering the general health. The attention of some of the most eminent physicians of England has been turned to this subject, and it may well engage the attention of physicians here, as well as of veterinarians and the public at large. The whole method of the care of animals, of dairies, and of meat-supply, is one requiring attention and regulation, especially in our cities and in markets.

VARIOUS LAWS UNDER OVERSIGHT OF THE BOARD.

The public health is so inwrought with the welfare of the people that it is not surprising to find provisions in very many general laws which have a bearing thereupon. In addition to these, there are others which are more special in their character, or which have directly to do with the office and functions of local Boards of Health.

In the sixth report, 1882, page 255–260, is to be found a list of health laws to that date, and, in addition, the seventh report, 1883, page 31, adds those more recently passed.

The laws to which most frequent reference is needed by Health Boards, are as follows:

Chapter	LXXI.,	page 117,	Laws of	1879,	as to vital statistics.
"	CLV.,	" 206,	"	1880,	as to local Boards, etc.
"	CXXV.,	" 160,	"	1881,	" "
"	CLV.,	" 217,	"	1882,	" "
"	CV.,	" 117,	"	1883,	" "
"	CLX.,	" 237,	"	1884,	" "

It not infrequently occurs that local Boards fastening their attention too exclusively upon one law or one section thereof, are misled as to the terms of the law. It is always wise in framing ordinances, or in taking any important action involving legal questions, either to ask the judgment of this Board, or to secure the best legal advice. As we often have occasion to obtain the opinions of competent authorities, we are thus sometimes able to aid local Boards in a proper interpretation of the law. It can scarcely ever be said of any series of laws that they are complete, and no doubt there will be found reasons for seeking to improve some of those already passed. But it is our experience that such Boards as have been guided by able legal advice, and been most active in the enforcement of the law, are the ones best satisfied with present legislation. Wise administration is more needed than active legislation. It is often claimed that Health Boards, especially in cities, should have greater attributions of power, and not be so dependent upon the municipal authorities. But it is to be remembered that the local jurisdiction of a municipality is always to be recognized. While there are most cogent reasons why a Health Board should not be a mere changing or ephemeral committee of council, and should have assigned to it special duties not to be interfered with by other governing bodies, yet it is also true that it should be ultimately responsible both to the council and to the people of the locality.

The only exception to this is, that in certain possible emergencies the interests of the State may be so far jeopardized by the delay of the locality, or by some local and political or personal complications as that it may reserve to itself the right, through its State Board or other State authority, to interfere, and cause to be done that which it may claim to be urgently necessary. In general, the principle of local health government is correct, and if the vicinage suffers by its own failures, it must bear the consequences. But there are more flagrant cases in which, no doubt, it is wise for the State to assert its own rights of local jurisdiction. As a rule these are best asserted in the higher courts.

The law passed last year as to local Boards in cities, extends their jurisdiction over certain evils and gives them powers which, while to be exercised with discretion, are manifestly important for the public welfare.

The law requiring the returns of marriages, births and deaths is

showing more and more its value as a means by which the State keeps an account of its vital increase, but is not as yet used in cities for information as to public health as it should be. The local registry which is now most important is that which will enable the keeper of vital statistics, in any decennial or semi-decennial statement, to tell precisely in what dwellings death has occurred, and the cause thereof, with age, etc. Thus not only is the registry of value in its legal and informatory aspects, but as directly pointing out disease localities or districts. For, however misleading such statistics might be for a single year, it is found that when there are enough data and over enough space of time, they are the unerring signals of sanitary defects, and point to many cases of avoidable death. And when it is remembered that each case of death on an average represents many other cases of sickness, it is seen how significant such data are as to the thrift and healthfulness of the population.

The law as to medical registry is valuable as furnishing an index of those who claim to have received a license to practice from some reputable institution, or to have been practicing at least twenty years in one locality. It is the mildest form of saying that those who offer their services as skilled in dealing with human life amid its greatest perils, should be able to show that they have been adjudged worthy of such confidence. Yet it is to be admitted that so long as no prosecutor of the pleas or other person is charged with the duty of inquiring into the validity of the copies of documents furnished, there is much opportunity for strategy. While the law does not and ought not to discriminate in favor of any one class, it ought some how to assure more fully that fraud shall not be perpetrated. The assuming of a title has been found an easy way of imposing upon the credulity of the people. While there are some evils which records and warning help to expose but which law cannot fully remedy, it is questionable whether some county officer should not be charged with the duty of examining into the genuineness of credentials.

A very gratifying result has followed the enactment of the law as to the sale of kerosene for inside lighting. Producers and dealers have found it to their interests to conform to this law, so that accidents seem to be far less common than formerly. We have not been able the last year to record a single case of injury in the State from the explosion of low grade oil. There will always be occasional cases in which spilled lamps or great carelessness result in burns, but there is no longer reason why any actual explosion should occur.

The law as to the adulteration of foods and drugs has received a proper share of attention. Herewith will be found a report from the committee having this in special charge. The object is to draw attention to the chief and most harmful adulterations, and to watch any new attempts at falsification. In some of our largest cities the duties of a local analyst might well be associated with other duties of a Board of Health.

The facts as to the operations under the milk law during the past year will be found in the report of the Milk Inspector. A change made last year weakens its force. Some legislation ought, at least, to give to city Boards of Health the right of rejecting imperfect milk, and of summary proceeding against milkmen who are found vending it.

The law as to diseases of animals has worked well, and has done much to protect the State. The special law as to glanders was also found effective.

There are some minor and verbal defects in some of the laws relating to public health and vital statistics, but, as a whole, it can be said of them that they are found as facile in application as most of the laws on the statute books.

WHAT LEGISLATION IS DESIRABLE FOR THE IMPROVEMENT OF TENEMENT HOUSES.

BY E. H. JANES, M. D., ASSISTANT SANITARY SUPERINTENDENT OF THE HEALTH DEPARTMENT OF THE CITY OF NEW YORK.

The sanitary condition of the houses of the poor is a subject to which public attention has so frequently been called that it is now hardly possible to deal with it without going over well-trodden ground.

From the fact that the moral, social and intellectual status of men and women will bear a certain relation to their sanitary condition, it follows that the practice of housing a large number of families under one roof, all having a common entrance and a common hall-way, where persons of different grades of intelligence, of moral culture and aspirations, are daily brought together, has a natural tendency to equalize the general condition, as it regards social and moral instincts. The more powerful influences will draw upon the weaker; neat and attractive surroundings will stimulate to worthy aspirations, while the opposite condition is almost certain to discourage noble effort, and to reduce, in some degree at least, the social and moral grade of persons who are daily subjected to such influences. Men and women who have, through misfortune, been deprived of the original conditions and associations under which they were born and reared, and compelled to associate with persons of a much lower grade of moral and social standing, struggle as they will against it, sooner or later find themselves nearing the level of those with whom they are in daily intercourse. Energy becomes stunted, or even paralyzed, moral sense to a degree blunted, and the mind gradually sinks to a condition of disappointment, followed by discouragement and misanthropy. Hence the importance of rendering the dwellings of the poor as comfortable and attractive as possible, that the sacredness of home may be to them, not

a simple myth, living only in fable or song, but a grand reality, encouraging the laborer in his efforts, and adding contentment and happiness to the fruits of his industry.

Although the object of this paper is not to portray in detail the evils connected with tenement-house life, a few general remarks on the subject, before suggesting a remedy, may not be out of place. The apartments allotted to each family in a typical tenement house, such as is usually occupied by the daily laborer, consist, usually, of one main room, and one, and sometimes two, small bed rooms. The main, or living room, used as a parlor, sitting room, kitchen and laundry, is ventilated by two windows, opening to the external air, and a door leading to the hall. There is also a fire-place, which is generally closed, a stove being pressed into the service for warming and cooking purposes. Adjoining this main room we find one or two small bed rooms, as the case may be, located in the central portion of the house, and, consequently, having no direct communication with the external air. These rooms vary in size, the average floor area being about eight by ten feet, each room containing a bed, one or two trunks, perhaps a bureau, while, suspended on the wall, is the extra clothing of the family. It is not easy to overestimate the evils of such an arrangement of sleeping rooms, where nearly one-third of the entire lifetime is spent. The importance of the admission of sunlight to every sleeping room during some portion of each day, is universally recognized and so well understood as to require no more than a brief mention on this occasion. The same may be said concerning the importance of direct ventilation. Human exhalations of organic matter assert their presence by their peculiar odor long after the gaseous products of respiration have disappeared in obedience to the well known law of diffusion. They adhere to the plastered walls of the room, to the bedding, clothing and furniture, and require an extended exposure to fresh air and sunlight to effect their entire oxidation. This cannot be had in the dark, pent-up bed rooms of the typical tenement house; and as each floor of such a house is occupied by two or four families, this evil is always present in proportion to the number of occupants.

Damp and filthy cellars, with an atmosphere poisoned by exhalations from accumulations of refuse and from imperfect foundations, the small yard in which is located the neglected privy, reeking odors from which are first to salute the visitor as he sets foot upon the

premises, are also among the features which call loudly for reform, to which may be added the massing a large number of tenements upon a small space of ground. As an example of the latter, it is not unusual to see a row of tenements fronting upon a street, and twenty or twenty-five feet in rear of these another row built upon the rear portion of the respective lots fronting upon the yards. In rear of these rear houses, at a distance varying from a few inches to two feet, stand the corresponding rear houses of the next street, and twenty or twenty-five feet in front of these last mentioned, stand the corresponding front houses. By this arrangement twenty houses, each twenty feet wide, and as high as it pleases the owner to rear them, may stand upon a space of about twenty thousand square feet of ground. Allowing eight families to each of the front houses, and four to each of the rear houses, we have for each family a ground space of only one hundred and sixty-six feet; and yet, even this will compare favorably with some of the crowded tenement-house districts of our large cities.

As long as such massing of dwellings is allowed with no legal restriction, we shall also have the like massing of human beings. The evils resulting from this excessive crowding, especially to the young of both sexes, who are thus early exposed to associations of the vilest nature; the strong inducement on the part of the older ones to seek at the dram shop and gambling house amusements which their own homes deny them, and thus prepare the way to vice and crime; the exposure to disease and death as a just retribution for this gross violation of sanitary laws, have been repeatedly and powerfully set forth from the pulpit, the platform and by the public press, and it now remains for us to prescribe such remedies as are needed and available for improving the homes of tenement populations. To this end we must secure such legislation as will place the whole tenement-house system under proper supervision. Houses at present standing should be placed in as good sanitary condition as their location and construction will allow. Those to be erected should be in accordance with strict regulations in regard to location and construction, and the number of occupants should be so restricted that each one may enjoy an adequate amount of air space, and in all other respects be favored with the ordinary comforts of domestic life.

The earliest attempt at tenement-house legislation of which the writer has had any practical knowledge, was the passage, in 1867, by

the Legislature of New York, of a bill entitled "An act for the regulation of tenement and lodging houses in the cities of New York and Brooklyn." When, in 1866, the Metropolitan Board of Health was organized, the condition of tenement houses in those two cities was such as to demand early attention from the newly-constituted authorities. The Board and its officers, during a considerable portion of the first season of their official existence, were busily engaged in dealing with cholera, which at that time invaded the two cities. How that disease was controlled is a matter of history familiar to all who take an interest in the success of sanitary effort in this country. This emergency having been met and disposed of, the attention of the Board was then directed to the condition of tenement houses with the intention of correcting as far as possible their existing evils, and preventing their recurrence. It was soon found that some special legislation was required to enable the Board to accomplish the work it had undertaken, and recourse was accordingly had to the Legislature of the State, which resulted in the passage of the above-mentioned act, the principal requirements of which were: First, that each and every room occupied as a sleeping room, and having no direct communication with the external air, should have a ventilating or transom window over the door leading into the adjoining room, and another window opening into the hall, the area of each to be three square feet. This latter window, although it was not strictly consistent with the privacy of a bed room, appeared to be the only means by which a thorough ventilation could be effected, and as the same section required a ventilator in the roof at the top of the hall, when both windows were open there was a considerable current established through the room, which, though far from meeting the necessities of the case, was a marked improvement on the stagnant condition of the bed-room atmosphere which obtained previous to these alterations. The next two sections provided for adequate fire escapes, for keeping the roof and stairways in repair, and conducting away the storm water so as not to injure the walls of house. The next section provided for sewerage, the disposal of excreta, etc., the construction of water-closets, privies and cesspools, in accordance with plans approved by the Board of Health. Sections 6 and 7 provided regulations under which cellars and basements could be occupied as dwellings. Section 8, for the disposal of ashes and garbage. Section 9, for the general cleanliness of the premises, including cellars, yards, privies, cesspools and drains; it required walls and

ceilings of the halls to be whitewashed at least twice a year, and the name of the owner or agent to be posted in a conspicuous place in the hall. Sections 10 and 11 provided for the inspection of tenements by officers of the Board of Health, and prescribed the conditions upon which such house could be vacated as unfit for human habitation.

Thus far the law applied to houses already existing; but the remaining sections were enacted to regulate those to be subsequently erected, and other buildings to be converted into tenement or lodging houses. The provisions were for restricting the massing of tenements by prescribing the distance to intervene between front and rear houses, and an open space in the rear of each rear house, size of rooms, height of ceilings and windows, construction of cellars, water-supply, etc. The act concluded by imposing penalties for violation, being a fine of from ten to one hundred dollars, or imprisonment for a term of not more than ten days, and an additional fine of ten dollars a day as long as the violation continued. And finally, a tenement house was defined to be a house in which more than three families lived, all having the same common entrance, hall and stairway, but doing their cooking and washing separately. These provisions, though not fully up to our present ideas of sanitary improvement, were at the time regarded by sanitarians and philanthropists as a long step in the right direction, and by tenement-house owners as high-handed and oppressive, since it meant a death knell to the continuance of their enormous gains. To the Metropolitan Board of Health, whose jurisdiction extended over the cities of New York and Brooklyn and portions of the adjoining counties, was given the duty of enforcing the provisions of this law; and it was decided to commence with the poorer class of tenements and deal with the most objectionable features so far as the construction, location and surroundings of each building would allow of the necessary alterations. The early attempts to enforce the provisions of this act met, as was expected, with a good deal of opposition on the part of landlords and agents, and it was not until these were made through the courts to feel that the Board was in earnest, that they began to yield gracefully to the requirements of the law. After considerable experience in dealing with some of the worst class of buildings, it was decided to exercise a greater degree of stringency, and to extend the work to all houses that came within the legal meaning of a tenement house, however slight the violation. As an instance of the rate at which this work was prosecuted, I might state that during the year

1869, there were in New York 39,270 bed-room windows and 1,922 hall ventilators inserted, and a corresponding number of other violations corrected. The result of this was to improve very materially the condition of New York tenements, and yet as the public became more interested and better educated in sanitary matters, further improvements were loudly demanded; and in response to a great public uprising in behalf of the tenement population, additional legislation in the form of amendments to the law was obtained in 1879.

The main provisions of these amendments were: Regulation of distance between front and rear houses, forbidding the placing of any tenement nearer than ten feet from the rear line of the lot, limiting the portion of ground to be covered by any such building to sixty-five per cent. of the area of the lot, and requiring that each sleeping room shall have at least one window of not less than twelve square feet area, admitting light and air from the street, yard, or as otherwise provided in a manner, and on a plan approved by the Board of Health. By this act the owner of a tenement house containing more than ten families is required to have a janitor or housekeeper, who shall reside on the premises, and have general charge of the same. The act further provides for the appropriation of a special fund to enable the Board of Health to continue tenement-house inspections, and enforce compliance with the law.

This later legislation applies principally to houses about to be constructed, and I will add that its measures have been strictly enforced, some discretion being allowed the Board of Health where circumstances admit of its being exercised. Corner lots are exempt from the sixty-five per cent. clause, but even in these cases the rear space of ten feet is retained.

From what I have seen of the working of this law, I am convinced that any reasonable system of legislation will result in the improvement of tenement houses, and a consequent elevation of their occupants. Under the law we have been considering, every plan of a tenement or lodging house is submitted to the Board of Health for that body's examination and approval. Not only are the means of affording light and ventilation, as shown on the several plans, carefully considered, but, pursuant to the law regulating the plumbing business, it is required that every such plan shall be presented for approval, and a copy of the plan, as approved, be filed among the

records of the Health Department. By this provision the department is enabled to refer at any time for information relating to the construction and plumbing of every tenement house built since the law took effect. Not only has this law secured to new houses some very desirable improvements that cannot be applied to the old, but the latter were made materially better by its workings, and, as these, year by year, are gradually disappearing and a better class of houses taking their places, a complete renovation of the whole tenement-house system may now be regarded as a matter of time. Legislation, to be effective, should be so framed as to enable us to take full advantage of the plan of the ground upon which tenements are to be erected. A full building lot in New York City measures 25 by 100 feet, and the law is so framed as to apply to such a lot. Doubtless a better result as to light and ventilation could be secured, were we able to take a portion from the length of each lot and apply it to the width; therefore, in any attempt at legislation this matter should be considered, as well as the general direction and width of streets.

Were I called upon to suggest points looking toward tenement-house legislation, I would say: provide first for a properly prepared foundation. It is well known that the more desirable portions of every city are selected for the better class of dwellings, while the tenement population is crowded to lower and less valuable districts, often consisting of ground reclaimed from swamps and marshes, and even from portions entirely covered with water. All such grounds are more or less defective in that the material used in filling contains usually a considerable amount of decomposable refuse matter. We can guard ourselves against exhalations from such material by properly draining the ground and preparing it with a thick layer of concrete, cement or puddled clay, sufficient to protect the foundation walls and cellar from moisture and ground air. Thickness of walls, quality of materials and other ordinary matters relating to the construction of a building, are generally provided for in the fire and building laws. The special legislation which is to apply to tenement houses, should provide for light, air-space, ventilation, drainage, the disposal of excreta and house refuse, water-supply and general cleanliness.

The admission of light requires, of course, windows of adequate size and number; but these may be so obstructed as to greatly impair their usefulness. To prevent this, massing of front and rear tenements should be prohibited, and the height of the building should be

regulated by the width of the street upon which it fronts. Narrow streets, bounded on both sides by rows of tall houses, are deprived of direct sunshine during a considerable portion of the year, and it often happens that for several weeks in the winter the sun is excluded from the lower stories of houses, on the north side of a street, by the tall houses opposite.

In regard to air-space, I would insist upon at least six hundred cubic feet to each occupant, and when a family increases beyond that capacity they should seek other quarters. There is a strong tendency to evercrowd tenements, which can be overcome only by strict and rigidly enforced legislation. More legislation is now being asked.

The law should provide that every sleeping room have at least one window of proper size communicating with the open air and capable of being opened to half its area. Where such windows cannot open into the street or yard, there should be a light shaft of at least twelve square feet area, extending from the ground to and through the roof, and so constructed as to allow an inlet of air at the lowest portion, that an uninterrupted circulation may be established. One objection, and a serious one, to this light shaft, is that it some times becomes a depository for filth and refuse of various kinds, exposing the sleeping rooms connected with it to foul emanations. This may easily be obviated by a wire grating or screen placed before each window, which, as it does not interfere with opening and closing the sash, will allow a circulation through the room. The arrangements for house drainage should be simple as possible, and yet, in construction, of the best material and workmanship. An uninterrupted communication with the out-door air, from a point in the main drain on the house side of the trap, through said house drain and main waste-pipe to a point above the roof of the house, is now, I believe, regarded by us all as indispensable. Sinks and other fixtures to be connected with the main waste should be simple and arranged in accordance with the best knowledge of the day. For the removal of excreta, I believe it advisable and possible to abolish the privy vault by legislation. This relic of barbarism is not only unnecessary for our convenience, but is a most disgusting nuisance wholly incompatible with our civilization. It should be emptied, cleaned and disinfected, and then filled with fresh earth. It is not so easy, however, to legislate a substitute any farther than to provide for some receptacle in which no

accumulation can take place. The substitute, which to a large extent is now taking the place of the privy vault where there is sewer connection, is the trough closet. The following is our specification as to it:

"That a receptacle, vault or sink be constructed of a depth not greater than two feet, which shall be impermeable and secured against any saturation of the walls or ground, and shall be connected at the upper end with the Croton water, and at the lower end with the street sewer, and provided with an outlet at the lowest point and on the bottom so as to admit of flushing with water daily, and the complete discharge of the contents whenever the outlet is opened. The outlet shall be kept closed, except during the process of flushing, with a tight-fitting plug, so as to effectually prevent the escape of foul gases and offensive odors; and sufficient water shall at all times be kept in the vault or sink to prevent solid matter adhering to the bottom. The bottom thereof shall be so inclined that the lowest point at the outlet shall be at least six inches below the lowest point at the opposite end."

It is not quite up to the spirit of our day, but it is up to the intelligence and habits of a portion of our tenement population, who still need to be further educated on this subject. I believe, however, that in the near future we shall be able, either by State or municipal authority, to introduce the water-closet into even the lowest class of tenement houses. It is now being done with success in the city of Dublin, where it is to be the only system in all classes of dwellings; and many owners of the better class of tenement houses in the city of New York have already placed water-closets in their houses. To be successful with this system, the closet should be of a kind as simple as possible, and with automatic flushing appliances of sufficient capacity to insure adequate flushing and cleanliness. Several of the improved hoppers now in the market would fill all indications, and be entirely safe in the hands of a large majority of well-meaning tenants. Where no sewers exist, we must resort to the dry system, for which the receptacle should be small and frequently emptied. Either dry earth or ashes will prove a successful deodorizer. The removal of ashes and garbage require prompt action on the part of public authorities, as well as on the part of the landlord. It is the duty of the latter to afford means for delivering the refuse to the public cartman, while the authorities should see that the cartman's rounds are made at regular intervals that the refuse may be promptly removed. General cleanliness cannot be effected without an adequate supply of water, the

importance of which is too obvious to need or even admit of any discussion. It should not only be brought to the premises, but to every floor of the house, that each family may use it freely. Cleaning, whitewashing, etc., of halls and such parts of the house as are common to all the occupants should devolve upon the landlord, while the tenants should be held responsible for the condition of their own apartments.

In every tenement house there should be some person with authority to exercise a general supervision over the premises, to abate and prevent the recurrence of nuisances, see that the house is kept in proper repair, be cognizant of any sickness among the tenants and promptly report to the proper authorities.

The occupation of any portion of a tenement house for other uses than as a dwelling should be restricted by law. And here I would begin by abolishing the ubiquitous saloon that exerts such an influence in degrading our tenement-house people. When we obtain a law forbidding the sale of intoxicating drinks in any portion of a building occupied as a tenement house, we shall have done something towards elevating a large class of our fellows. Other industries, such as storing rags and hides, and everything included in the catalogue of offensive trades, using the lower portion of the building as a stable, etc., should be forbidden. Finally, the builder should be required to file in the office of the sanitary authorities a detailed plan of every house he proposes to build, including the plumbing and fixtures, where it should be kept for subsequent reference.

So far, the legislation proposed affects the tenement-house owner alone, and although it is in no degree severe, I believe the tenant should bear his share of responsibility for the condition of his home, sanitary and otherwise. There are nuisances detrimental to public health which often occur in connection with the tenement house, wholly unknown and even unsuspected by the owner, and for which the tenant, either from stupidity or vicious inclinations, is alone at fault. Tenement-house reformers are too apt to extend all of their sympathies to the poor tenant, who is regarded as the oppressed victim of an avaricious landlord. While the deserving poor need, and should receive our sympathies, we must recognize the fact that there is another class to whom the landlord is the victim. I refer to that class of ignorant, vicious people who appear to regard their landlord as a natural enemy, whom it is their duty to injure as much as possi-

ble. Against this class of people he has but little protection, and I do not know that much could be afforded by legislation. I would, however, give him the power to deal with such tenants by summary ejectment whenever they are found violating any of the sanitary regulations. Were it possible to eliminate this class of people from the general tenement-house population, there would be less cause to complain of the sanitary condition of tenement houses, since the law gives us so much control over all constructive arrangements.

WATER-SUPPLY.

BY EZRA M. HUNT, M. D.

The question of water-supply can never cease to be of prominent importance in all considerations of public health and comfort. The necessity that it shall be abundant and easily accessible is imperative for purposes of cooking, of cleanliness, of provision against fires, of manufactures, and for use as a drink. As a great financial and economical question, it has to do with general material interests, while, in its bearings on personal health, accurate and correct knowledge as to it is of the first importance.

As the original fountain of all water-supply is above the earth, instead of in it, it is a very natural question why we do not gather it as it comes fresh from the clouds, instead of drawing it back again from the ground. There is so much force in the inquiry as to have led many to claim that not sufficient reliance is placed upon rain-water for potable or drinking-water use.

Denton, in his work on sanitary engineering, says: "I hold the opinion that, in fact, there exists no more certain source of a pure and sufficient supply than that of properly collected and properly filtered rain-water, which is, with care, to be secured by all persons alike.

"Rain-water collected from clean surfaces is itself so free from pollution that it requires filtration only to protect the consumer against the accidental defilements of mold, soot, and those minor organic impurities which occasionally collect on roofs."

Even the necessity of filtering depends very much on locality. The purest natural water is rain-water. Whilst, in its descent, it comes through the air, the amount of mineral or organic matter with which it comes in contact is very small, except in cities dense with the smoke from manufactories. It is both theoretically and practically far less than when it is drawn from the ground. It has advantages of oxida-

tion and purification fully equal to those occurring in the soil. It is especially free from organic matter. While we do not propose to give it undue prominence over all other sources of supply, yet there must ever be, in parts of this State, much reliance upon it. There will always be places where "rain-water from roofs, or prepared impermeable surfaces, constitute the only source of supply for separate dwellings." We, therefore, briefly outline the mode of its collection and preservation. It is best collected on slate roofs. The leader should always be so arranged as that the first rain can wash off the roof and not discharge into the cistern. Two or three automatic arrangements are used for this purpose. This prevents any fouling from the dust of roofs, the excrements of birds, from leaves, or from the "cellulose or weather-beat" of shingle roofs, if they are relied on. If a leader ends in a hogshead or tank proportioned in size to the roofs, it can receive the first washing, and, when full nearly to the top, an overflow into the permanent cistern will carry off the pure incoming stream, and leave the former to be used for non-drinking purposes. It is best, also, to have the mouth of the leader, as it leaves the roof, protected by a copper gauze, or a galvanized wire covering, so as to prevent any lodgment of leaves, etc.

Whether the cistern shall be near the roof in some upper room, or whether it shall be in the ground, will depend much upon convenience and locality. If near the roof, it should be well built, preferably in a circular form, or, if square and lined, should have such lining as will not furnish lead or copper or too much iron to the water. The overflow should be so arranged as not, when its pipe is empty, to be an open tube to convey foul gases to the water. It, therefore, should not enter into the general soil pipe. The cistern, while constructed so as to be accessible for cleansing and while generally needing a covering, should not be so made as to confine stifled air over the water, but admit of some circulation. As water kept near the roof is apt to become very warm in summer, some devices similar to those used for the preservation of ice are sometimes resorted to for keeping the cistern cooler. Most prefer a cistern in the ground, which then should be deep enough to keep cool in summer and not to freeze in winter, or to be cracked by the action of the frost. As the weight of water is ten pounds to the gallon, the receptacle for any large amount needs to be made strong. Cast-iron or wrought-iron tanks, properly painted or dipped, after the Angus Smith method, are now often used. The circular form is generally the best, as it gives the most strength. The capacity

of the cistern should be ample, as it is best to store the water of long rains rather than that of occasional summer showers. The reason for this is that the first rain-water washes out the impurities in the air and upon roofs. A tank or cistern holding one thousand gallons would be contained in a space six feet square and four and one-half feet deep, or in one of five feet square and six and one-half feet deep, or in a circular cistern of five feet in diameter and fifteen feet in depth. If we reckon the average rainfall at thirty inches, or seventeen gallons a square foot, and allow a loss of six inches for the first water and short rains, and six inches for evaporation, "there would be left on the average roof of three hundred and sixty square feet, available for storage, five hundred and forty cubic feet of water, or three thousand three hundred and seventy-five gallons in the year, which, for the house, would be an average daily supply of nine gallons." "A tank sixteen feet long and ten feet wide will hold one thousand gallons in every foot of depth." The building of a cistern in the attic needs to be well done in order to prevent leakage. When made in the ground, much will depend on the soil. If a clay, the cement is sometimes applied directly thereto after an accurate circular excavation has been made. The cementing is mostly done on brick-work, laid in the best of mortar. Where bricks are used the coating of cement should not be less than one-half inch in thickness. Where the cement is applied directly to the sides of the excavation it is usual to put on three coats, the whole being not less than one inch in thickness. As cracking of the cement would not only cause leakage of the water, but also its possible contamination from outside sources, the cistern must be made in the very best manner. The top is usually covered with a stone flag or cast-iron plate, large enough to serve as a man-hole and air-hole. Such cisterns do not need frequent cleansing, but need examination occasionally as to their condition. Some prefer to build two smaller cisterns close to each other, relying upon one for the potable or drinking-water, and the other for the general supply. It is easy to arrange the inflow leader so as to shift it to the drinking water-supply and thus make selection of the time of filling.

FILTERS.

As the subject of filtration comes up in connection with rain-water as also with other waters, we shall here say much that is applicable to

all forms of artificial filtering. Its design is often three-fold. First, the removal of all foreign particles in suspension. The retention of dissolved matters which are in solution or too minute for the first process of straining. The aeration of the water, or a process of oxidation, by which actual change is wrought upon organic matter in the water. To this might be added sedimentation, which is merely the settling of particles which, being of a higher specific gravity, or greater weight than the water itself, settle to the bottom without any real filtration.

The first process is purely that of mechanical separation or straining, which, by furnishing some fine porous substance, separates many of the finer particles which would not settle soon or at all to the bottom by sedimentation. In large reservoirs settling basins are often used for this form of sedimentation. Even if filters have to be used, the opportunity given for the settling of the coarser particles makes the subsequent filtration more effectual.

It is seldom necessary to use such coarser methods for cisterns if the roofs and leaders are properly cared for, although the settling of such particles to the bottom of the cistern is a reason why no pipes of outflow should be as low as the bottom of the cistern, and also a reason for occasional thorough cleansing, or at least yearly.

The second method of action of a filter has been called that of adhesion. Prescott illustrates it thus: "A solution of organic coloring matters, though so perfectly free from suspended solids as to show no particles under the microscope, when passed through certain porous substances, leaves the coloring matter behind. The capillary attraction of the porous surfaces for the dissolved solids takes them out of solution. Dissolved gases are, to some extent, withdrawn from solution in the same way." The process seems to depend upon the fact that particles of sand, charcoal, or other substance, are so close to each other that no rills of water can flow between them, but only drops or minute capillary currents of the water. It is then brought directly in contact with the adhesive or absorptive surfaces of the material used, and so the very finest particles and the dissolved solids are retained.

If there is too much weight of water it is pressed too rapidly through the filter and so is not allowed time for this slower action. It is a rule in filter-beds not to have over two feet of water.

The third process, that of oxidation, although regarded by most as distinct from this, is closely associated with it. The water thus passed

minutely through adjacent surfaces, itself gets greater capacity for air admixture or adhesion, while the minute particles of sand or charcoal also allow much air between their surfaces. Thus the suspended or dissolved particles are especially exposed to air and undergo that process of oxidation by which organic material is destroyed. "The oxygen condensed by adhesion in the pores is extra active." By the minuteness of the particles of the filtering material and by compelling the water and the air to be jostled about in minute currents amid multitudes of solid inorganic particles, you get that motion which is always favorable to oxidation, and therefore to the removal of all changeable or decayable matter from the water. So not only is this removed but when removed the air and water aid in its destruction, and so help to preserve the filtering-bed in action. Yet, as often more air than is supplied by the water or by the aid in the filter material is needed, as a rule filter-beds should not be so constantly covered as to prevent access of the atmospheric air, for it is one of the conditions of a good filter that it should expose the organic matter which it catches to the largest possible amount of atmospheric air both during the act of its catching it and at intervals between, by the free access of air thereto. Sand, although valuable as a mechanical separater, is too porous to exclude all suspended matter, and if used alone, too fine by reason of its compactness, and does not favor a capillary flow either of the water or the air. Animal charcoal, and especially granulated animal charcoal, being closer in texture on the surface and more open in its particles, has a more valuable porosity, except that it is more difficult to make the water pass actually through its substance. "Due care of a filter requires that all suspended matter, *i. e.* floating particles, should be removed before the water reaches the filterer." Charcoal probably owes more of its value as a filterer to the minuteness of its pores or interstices through which the water in its minute circulation is brought into contact with air, than to any other property. Those who construct filters need to bear in mind such facts so as to adjust mechanical arrangements and the use of materials.

Filters also have a certain value in the more general aeration of the water. Thus, water which has been boiled and has a *deadened* taste, although free from organic matter, by subsequent filtration through aerated material has this overcome. The importance of occasional access of air to filters is such that Denton says that "all filtration in

which the filtering material is placed constantly under water, produces but an imperfect effect. To secure the best results the filtering material should be intermittently aerated." Air is a far better cleanser of a filter-bed than water. The idea, then, of a perfect filter is one which, by the mechanical arrangement of the parts or particles of which it is composed, secures the most perfect mechanical separation of every particle in suspension in the water; which, by adhesion to its surfaces or "mechanical entanglement" in its pores and the securement of a capillary circulation of air and water through it, secure the retention of all minute or dissolved matter; which also, by this arrangement and by intermittent exposure to air secures the most perfect facilities for the aeration of the water and oxidation of all organic matter in it." As there may still be an occasional accumulation of the collected matter, it should admit of occasional removal for cleansing. The chief idea of a filter is well illustrated thus:

Take any common vessel perforated below, such as a flower-pot, and put a small, clean piece of sponge over the hole. Fill the lower portion with gravel stones, over which place a layer of finer gravel and on these a layer of clean, coarse sand, the proportion of each being about the same.

On the top of this place a lid of unglazed clay, either very porous or perforated with small holes, and in this a stratum three or four inches thick of well-burnt, pounded animal charcoal. A filter thus formed will last for a long time, is easily cleaned and will be found to act both by mechanical and chemical purification. (See Blyth and Tardieu.)

The following are good directions from so good an authority as Dr. Parkes:

"The filtration of water is not difficult, even if you cannot afford to buy a regular filter. The compressed charcoal blocks are cheap and good; if they clog, rub them gently with a towel, or, if that does not clear them, with a hard brush; if they are still clogged, they must be gently scraped with a knife. But if the charcoal block is too expensive, a simple filter can be made as follows: Get a common earthenware garden flower-pot; cover the hole with a bit of zinc gauze or a bit of clean-washed flannel, which should be changed from time to time; then get some rather small gravel, wash it very well and put it into the pot to the height of three inches; then get some white sand and wash it very clean, and put that on the gravel to the height of three inches; then buy two pounds of animal charcoal, wash that also by putting it into a jug and pouring boiling water on

it, then, when the charcoal has subsided, pour off the water, and put some more on for three or four times. When the charcoal has been well washed, put it on the sand and press it well down. Have four inches of charcoal if possible. The filter is now ready, pour water into the pot, and let it run through the hole into a large glass bottle.

"After a time the charcoal will get clogged; take off a little from the top and boil it two or three times, and then spread it out and let it dry before the fire. It will then be as good as ever. From time to time all the charcoal and the sand also may want washing. The sand may be put over the charcoal, and not between it and the gravel; but this plan sometimes leads to the charcoal being carried with the water through the gravel and out of the hole. The sand stops it.

"By filtering in this way, and by boiling the water, many dangers are done away with.

"If you have a rain-water tank, always filter the rain-water before using it for drink or cooking, as rain-water often is collected from dirty roofs or becomes impure in the tank."

One plan of a cistern and household filter is given by Prof. H. B. Cornwall, in our second report, 1878, pages 100–102. A usual method is to have the part of the cistern which receives the rain-water partitioned off by a brick septum, smaller than the division from which it is to flow out. As the bricks are porous and made from clay free from organic matter, this method is often found quite efficient. The bricks are the usual hand-made bricks, often laid on edge with a good quality of mortar sufficient to hold them in place. Where the cistern is large, the circular or arch form is preferred for strength. This serves some of the purposes of a filter, but, because it cannot be removed for cleansing and is most of the time in the water, so as not to allow intermittent aeration, it is chiefly mechanical in its action, and if the water has much impurity will become clogged. Yet if, when the cistern is low, access is had to the wall, it can be thoroughly rubbed with a stiff brush, and air blown through the bricks by a strong common bellows, and thus its power of clarification be renewed at the time the cistern has its cleansing.

Instead of this, in small cisterns, a similar septum is encased in a strong iron frame-work, which fits into a groove into the cistern, and can be removed and aerated and cleansed when desired. This may be made of thinner porous brick, or clay. Charcoal is also thus used in form of blocks. With our State facilities for clay shaping, there is no reason why portable filters should not be constructed, either of brick specially made for the purpose, or a double row of slabs of clay

fitted to each other, between which filtering material of sand, gravel, charcoal, etc., can be used. Such a filter could be placed so as not to extend to the bottom of the cistern, but to form a kind of box.

Another plan, suggested by Prof. R. C. Kedzie, is very feasible:

"To remove matters held in mechanical suspension it is a good plan to provide a small filtering cistern, filled with clean sand, to receive the water as it flows from the rain-water pipes, carrying this water, after filtering through the sand, directly into the main cistern by a lateral pipe connecting the two cisterns.

"A very simple and inexpensive arrangement will exclude all insoluble impurities from cistern water as it is pumped out. This is constructed as follows: A brick box, twelve to eighteen inches in internal diameter and twelve inches high, is made with well-burned, hand-pressed brick (machine-made bricks are too hard and impermeable by water), laid up with water-lime (the bricks may be laid up edgewise), the box is arched over at the top, and through this arch the pipe of the pump passes inside the box, the pipe being securely fastened in the arch by water-lime. When the pump is worked, the water that reaches the pipe must pass through the brick, by which means all mechanical impurities are prevented from passing to the pump; the water is strained before it is pumped."

Denton, in his Sanitary Engineering (pages 40 and 143–144,) suggests two species of filters: one a box appended, in the tank or cistern, to the pump which drives the water into the house and serving to strain out suspended matter, and the other an oxidizing filter in the house, containing filtering material made of finely-broken stone potsherds and animal charcoal. This admits of aeration by intermittent filtration also, and is self-cleansing by letting the water itself be so turned on as to work out the filtering material.

Spongy iron, made of hematite, which is a common ore in this State, is also available as a filter in place of sand, charcoal, etc. The spongy metallic iron is so reduced from an oxide without fusion as to preserve its minute, particulate, spongy, porous condition, and in this form, answers an excellent filtering purpose. By washing and drying the layers or materials from which filters are made, we are often able to use them for a much longer period. Instead of taking the filter apart, it is often possible, after it is dry, to blow draughts of air through it. If twenty or thirty grains of solid potassium permanganate, and ten drops of strong sulphuric acid to a quart of distilled water, is poured through the sand, gravel and charcoal filter, and afterward three gal-

lons of distilled water, to which a half ounce of muriatic acid has been added, and then a gallon or more of pure water, the filter will be renewed. Other varied forms of filter, both patented and not patented, are in the market, but with the principles of their action thus made plain, a choice can be made.

We next come to that supply of water which is derived from the ground. Although originally from above, it is variously deposited or retained in the earth. That which is found in lakes and streams, in relation to animal wants, is generally known as the surface water-supply. It is that for which nature has its own reservoirs on the surface of the earth in rivers and streams, made to receive the drainage of water-sheds more or less extended. Sometimes this is spoken of as of two kinds, viz., the surface-water from uncultivated or sterile lands, and that from cultivated lands, since the kind of soil through which the water flows furnishes it more or less with the soil organic matters, which it contains, as well as with mineral ingredients. If the organic matter is so superabundant as not to be diminished by filtration through the soil, or oxidized by exposure to the air, it makes the water impure, while if limestone or other rocks abound, the character of the water is modified in this regard. Also, special plants may give a peculiar odor to water, or, when in very great abundance, may add to it much decomposed material. It has the advantage that being on the surface it is exposed to air and sunlight, and often, by its motion over rock and pebbly bottoms, is constantly aerated. How real is this advantage is sometimes illustrated by the freezing of rivers which are somewhat impure. Then, because of the exclusion of the air, the water which in the summer was not complained of, in winter becomes scarcely fit for use. The disadvantage of such exposed sources of water is that they are subject to various artificial sources of pollution from cities, factories, dwellings and soil enrichment on their banks. Where these sources of contamination abound, the water will be preserved longer by a sanitary patrol like that now exercised by the combined Boards of Jersey City and Newark over the Passaic river. This constant watchfulness now prevents from passage in to the river a great amount of crude sewage and factory products, which formerly were freely discharged into it.

Next is the water-supply derived from shallow wells. These wells are those which are fed by land or surface springs. Though some of them are spoken of as deep, "they depend for their water upon the

area immediately surrounding them, the rain-water falling upon which sinks downward and laterally toward the bottom of the well. The quantity procurable may be likened to the contents of a cone, the base of which is the area around the well, and its apex the bottom of the well, the contents being renewed from time to time as the rain falls. The extent of this area, or base of the inverted cone, is the greater the more porous the ground is for any given depth of well." Such is the water on which, in the absence of public supply, most depend. By passage through the ground strata, and by process of filtration and oxidation, it is usually pure, unless in its course it has derived contamination beyond the power of the natural forces in operation in the ground and air to neutralize. Not only are some soils, such as gravel and sand, more porous than others, but rocks, also, differ in porosity. Thus the new red sandstone is so porous as to act as a filter, and often removes much organic matter. Some forms of rock contain organic matter.

The next supply is that from springs. These are governed in position and depth by that of the different layers of the earth structure. Water finding its way to an impervious bed, has its springs or rivulets formed along that bed, or a water-level there maintained. The direction of the slope, or dips in the slope, or a sudden change in the formation, may allow the water to appear on the surface as a spring, or to be reached by a well. If these are not very deep they represent surface water of recent percolation through soil, and often rise and fall according to the abundance or lack of rain, and so, like the shallow wells, represent the ground-water.

Next we have the deep well which represents what is sometimes called the resident water or the more constant deep water level which is beyond the seasonal influence of drought or storm. To this class belong deep wells, driven and bored wells when deep, artesian wells and most springs of the deeper water-bearing strata.

Of these it may be said in general that supplies nearest the surface may be very excellent if only from the upper soil and surroundings there is no super-abundance of organic matter. They even have the advantage of the more active and continuous presence of air for oxidation purposes. Their risk is that pollution to streams or to wells or to soils about them are more easily added than to the deeper reservoirs.

The deep sources are much surer to be free of organic or decom-

posable constituents although sometimes altered in composition by the mineral ingredients they have found or with which they are brought in contact at their base.

As to each of these we only desire to single out the more important suggestions and precautions. First as to river and lake supply. Whether this shall be relied upon will depend upon the purity of the source, the character of the country through which it flows, the possibility of preserving it free from contamination such as would add to it decomposable organic matter, or such mineral matter as is harmful, or such taste either from mineral or vegetable sources as would give discomfort. If any such matters are added the question also arises as to how far these are self-correcting in the flow and exposure of the stream and what means can be used to prevent or neutralize the impurity. Also, as a test of actual condition we need the repeated examinations of chemists and the testimony of close medical observers, who, by actual statistics of sickness and death and close observation and analysis of cases, can be able, with reasonable ground, to have opinions which can serve as guides.

Where, owing to appreciable and definable causes, there may be contamination or cloudiness or discoloration or taste, it is to be considered whether filter beds or other methods may not avail for partial or temporary unfitness. Thus even the taste and smell from water plants, as from such as the nostochiæ species, are greatly improved by proper filtration.

The *character and condition of reservoirs* needs to be carefully examined, both as to cleanliness, and as to what is best in the agitation or aeration or protection from heat of the impounded water. For it is known that reservoir water is not always so pure as the source from which it comes and that there are often no comparisons of conditions and strange neglects of examination. We not infrequently find reservoirs that have not been cleansed for years or properly investigated to know whether they are in need of cleansing, with gates or other wood-work or appendages in an improper condition, and with adjacent soil contamination by reason of added pollutions. And wherever a city is supplied with water by a company it is especially important that knowledge as to these matters be sought by the corporate authorities. The reservoir at Camden has recently been cleaned with great advantage. The service pipes, too, are sometimes found in an improper condition, and those having intermittent supply

may need aeration. The growths and deposits on these have sometimes been such as to affect water. If the joints are caulked with organic material, as hemp, etc., the water is sometimes polluted and unpleasant to the taste. The plant life of reservoirs and pipes sometimes needs microscopal examination. Whether a river shall be used as the natural drainage for a water-shed for the inhabitants near it, or whether it shall be practically the water-carriage for sewage, or whether it shall be the source of water-supply, is often a difficult and always a relative question. We must incline to the belief that in the country, where the rain-fall is large and so many other sources of supply are available, that rivers should not be resorted to where water can be obtained from series of wells, gravel bed or other water-bearing strata, or impounded in reservoirs depending upon a supply high up amid uncultivated and comparatively uninhabited hills. This is accomplished by arresting the flow of the storms at a point high up in their course, where forests abound or where there are few inhabitants, and where it does not occasion great overflow of lands. Water thus secured is generally far better than that nearer the outflow.

Upland surface water from uncultivated grounds, which, after percolating through the soil, can be gathered either from springs or wells, or from a kind of elongated well in the shape of a reservoir on the edge of a hill, or so as to intercept a water-bearing strata, is by all acknowledged to be a most reliable source of supply, so far as quality of water is concerned.

The average rain-fall of the country must, with due allowance, be taken into consideration, together with the amount of water likely to be needed. For this State the general rain-fall is forty-four inches. One inch of rain falling on a square foot, gives rather more than half a gallon, so that forty-four inches of rain-fall a year represents a little over twenty-two gallons for each square foot.

There needs to be a careful study of the natural water-shed, its extent, what its loss is by rapid flow from the surface, by sun-heat and evaporation, and by any artificial interruption of or addition thereto. The character of the soil and of the underlying strata needs to be known. The Princeton Water Company, after a careful study of various sources of supply by competent engineers, concluded thus to intercept the supply from a gravel formation on a farm not very far from the town. "The water-works for the supply of Glasgow and

Greenwich, in Scotland, and those of Manchester, Sheffield, Barnsley and many other places in England, are admirable specimens" of the rain-fall of higher grounds thus collected and stored for use. Our own State gives many advantages for this kind of gathering, in cases where the rivers can more profitably be used for sewer delivery. While the supply is equivalent to that from shallow springs and wells, it is a choice of the advantages of percolation and storage, where there is freedom from the dangerous forms of organic matter. When such sources of supply are sought, the choice must be made by those who are judges; and it is seldom that such err in thus securing a good supply.

Many of the wells considered to be deep wells are not such in the technical sense. The Hydraulic Engineer, or the Geologist, by a deep spring or well as sources of water-supply, has reference to that source of water which is so deep as not to be directly affected by the rains of any one season, but which reaches down to that residual water in the earth which has a constancy of presence which does not directly depend on the supply given to it from above by any one season. Such water is generally free from organic matter because it is far from the presence thereof, and in its passage through the soil and the air which the upper ground contains it has been freed of all such substance. To this there are a few rare exceptions, by reason of the character of local deposit or strata or from fissures in the rock formation. Such water, however, by reason of pressure and the prevalent mineral character of the geological structure through which it passes or on which it rests, may have a mineral impregnation which imparts to it odor or may give it either disturbing or valuable mineral properties.

These various forms of wells are fully treated in the Geological Reports for 1879 and 1882. Whether in any given locality such a source of supply can be depended upon is scarcely known except by actual experiment. While these wells help to shut out organic matter from the surface by reason of the water being drawn through tight tubes, yet it sometimes happens that the earth does not pack closely around the tube and that the outside of the pipe will serve as a course by which foul surface or upper soil liquids will find their way directly to the little hidden well at the bottom of the tube, and so be drawn up without much dilution.

The various facts thus condensed and presented as to the sources

of water-supply, will serve to aid the reader in appreciation of the problem and the conditions involved in the securement of so important an essential to personal and public health.

TESTS OF THE PURITY OF WATER.

Too much dependence must not be placed upon the opinions as to the goodness of water which are given by the tasting of that which has just been drawn, or by persons accustomed to its use. Water may have no taste that would be criticised, or seem very refreshing to the thirsty one, even when dangerously impure. Then, too, by use we become accustomed to a particular water, and may prefer it quite independent of its real purity. Also, it seems to be a part of human boastfulness to claim that one's own well is the best in the neighborhood. Nor is it enough that no actual sickness has been traced thereto. It is marvelous how resistful some persons are to imperfect foods and drinks, and how the forces of a reserve energy of health either resist or compensate for depressing influences, or finally there is an adjustment that conceals the evil, or like an engine with a little extra friction, only demands the production of a little more propelling force. Yet there are others who are more affected, and all are making a wastage of resisting power that is more wisely and usefully expended in some other direction. While one need not live in constant suspicion of evil, where the methods of protection are simple and where occasional outbreaks of violent disease reminds us that neglect may be destructive of life, it is well to know how to avoid or correct the error. Often there is need of such examination of waters as can only be made by sanitary experts. The chemist, the physicist and those accustomed to study and weigh all the facts which determine the purity of water, may need to be consulted where the evil threatens serious results. The following ready tests, as suggested by Prof. R. C. Kedzie, of the Michigan Agricultural College, will serve to guide as to the quality of water:

"The following methods of testing such water are presented, not as the most complete possible, but such as any one can employ without the skill and appliances of the practical chemist:

"*Color.*—Fill a large bottle made of colorless glass with the water; look through the water at some black object; the water should appear perfectly colorless and free from suspended matter. A muddy or

turbid appearance indicates the presence of soluble organic matter or of solid matter in suspension.

"*Odor.*—Empty out some of the water, leaving the bottle half full; cork up the bottle, and place it for a few hours in a warm place; shake up the water, remove the cork, and critically smell the air contained in the bottle. If it has any smell, and especially if the odor is in the least repulsive, the water should be rejected for domestic use. By heating the water to boiling an odor is evolved sometimes that otherwise does not appear.

"*Taste.*—Water fresh from the well is usually tasteless even though it may contain a large amount of putrescible organic matter. Water for domestic use should be perfectly tasteless, and remain so even after it has been warmed, since warming often develops a taste in water which is tasteless when cold. If the water at any time has a repulsive or even disagreeable taste, it should be rejected.

"*Heisch's test for sewage contamination.*—The delicacy of the sense of smell and of taste varies greatly in different individuals; one person may fail to detect the foul condition of a given water, which would be very evident to a person of a finer organization. But if the cause of a bad smell or taste exists in the water, the injurious effects on health will remain the same whether recognized or not. Moreover some waters of very dangerous quality will fail to give any indication by smell or taste. For these reasons I attach especial importance to Heisch's test for sewage contamination or the presence of putrescible organic matter. The test is so simple that any one can use it. Fill a clean pint bottle three-fourths full with the water to be tested, and dissolve in the water half a teaspoonful of the purest sugar—loaf or granulated sugar will answer—cork the bottle and place it in a warm place for two days. If in twenty-four to forty-eight hours the water becomes cloudy or milky, it is unfit for domestic use. If it remains perfectly clear it is probably safe to use."

Wells sometimes change in the quality of water. This may be owing to something having fallen into the well, to a seam in the adjacent or underlying rock which has become saturated with filth from some distance or serves as an inlet for some cesspool, or from some sudden discharge or pressure from a cemented privy or some other source. More frequently it happens thus: A cesspool or slop-pipe, or other foul source of organic matter, has for a long time allowed the soil not far off to become saturated without any appreciable effect, because the amount was too small so to saturate the soil as to cause soakage therefrom.

"In the case of a well supplying one or two families only, the circle of measurable influence, as far as the height of the ground-water is

concerned, is quite small; but this is by no means the circle of possible contamination; for the water drawn from the well is not taken from that which falls within this limited area, but is taken from that portion of the ground-water which happens at the time to be passing through the well, so to speak. In most cases, as has already been stated, there is a movement of the ground-water, and it sometimes happens that a source of contamination may be very near the well without affecting it, owing to the fact that the direction of this movement is such as to carry the drainage away from the well. If the supply of water be abundant, it may be possible for offensive or injurious matter to be so diluted that no perceptible effect is produced on the well; but, as the ground becomes more and more charged with decaying substances, the danger of future contamination becomes greater."

Where a well or other source of water-supply has been found and proves satisfactory, it should be considered such a treasure as to be most carefully preserved. The owner should not allow any source of soil contamination to occur within a hundred or more feet of it, and no storage of any accumulated filth within two hundred or more feet of it, according to the character of the soil and underlying structure. If the soil about it is made very rich by fertilizers, or not thoroughly cropped, it may become a source of contamination. Much, also, depends on *the mode of construction* of reservoirs, wells, etc.

Should they be exposed to air.—This is a relative question. If a body of pure gathered water fills its receptacle very nearly or quite full, and is then covered by a clean non-absorbent cover, it may thus be kept so much from decaying leaves, organic matter, foul air, sunlight and heat, as to be comparatively better than if exposed to the free play of air and wind over it, which otherwise would be better. Facts as to taste, as to algoid growths, etc., seem to show that water impounded, as in reservoirs, may become "deadened" or stagnant, or be of different quality from that of the stream it comes from, even where the reservoir is not foul. This, too, has been found especially true, where it is carried through aqueducts which are not full and are not well ventilated, in which the sides, as well as the water, become impregnated. This does not occur in service pipes, kept full, from which supplies are being drawn, unless, by reason of a change of level or supply, there is at times partial emptiness.

Wells, too, may become stagnant when there is very little or any flow into them, or when heavy air settles in the well between the water and the top of the ground. As a rule, then, we would say wells are

better when exposed to the air, if the air about them is not contaminated, and if they are so located and exposed that currents of air can pretty freely circulate in them. But as wells often need to be closed for safety, or are located in the close area of houses, some have advocated that they be so walled about and cemented a few feet down from the top, and then so fitted with apparatus for drawing the water as that the well shall be sealed from the outer air, and the water depend for its supply upon the air drawn from the lower ground as a result of constant use.

Allied to this is the question whether wells are not benefited by modes of drawing apparatus which go down into the water and agitate the air above it, as also the water, and so aerate it. It has been claimed that the old oaken bucket thus aided to purify the water, and that chain pumps and other modes of drawing, which stir the water, have this effect. When we know how water can be aerated by pouring from one vessel to another, and that air in holes becomes stagnant much more than most suppose, we regard it as wise to have open wells where proper protection and situation will allow it, and where the water is agitated in the drawing. We especially object to surface wells located in cellars. Open wells are easily protected by a cover or screen of perforated metal work. Both for the purity of air and of water, all dug wells, whether open or closed, should have the walls cemented at least six feet or more down from the surface, according to the character of the surface soil. This helps to secure the influx of the water into the well from a lower level, so that the water drawn is either that which is from a lower strata or water-level, and spring-like, or that which has been forced to go through a soil percolation down to this point.

In excavations for wells, care must be taken to have them exact circles, so as to secure a stronger and more accurate construction of the lining.

Where, because of the looseness of the soil, a curb is needed, oak, elm or yellow pine plank or boards are generally used, because if wood is used it is desirable to have that which has no unpleasant taste and which will last long under water without decay. Brick of good quality and of a circular form are now preferred to stone, as the placing can be more accurate, and they admit of closer binding by mortar or better covering for the part needing cement. It is important not to place wells too near trees, as not only do the roots often

impregnate the water, but by their presence disturb the lining. The careless construction of wells too often leads to their deterioration. Ernest Spon, in his work on "Sinking and Boring Wells," says: "Too much care cannot be bestowed upon the steining (the cylinder of brick work). If properly executed it will effectually exclude all objectionable infiltration. * * * Half the wells condemned on account of sewage contamination really fail because of bad steining."

The steining of the well should always be carried above the level of the ground, and some of the cement used outside as well as inside, for the upper courses of brick. It often happens that wells become contaminated by slops and spilling about the top. Vessels are carelessly rinsed or slops thrown out until all the soil about is kept damp or over-saturated with filth, ready to be stirred into activity when sun or temperature favor. We know of one well in the State long known as the "Sickness Well," because of fatal cases that were probably attributable to this very cause. After a thorough outside cleansing and a change of method it became entirely pure.

If wells are thus finished and graded around so as to form a slight descent, and then covered level with a flat paving stone, thorough protection is insured. The size of hole in the stone will be governed by the views held as to ventilation and by the form of apparatus used for drawing the water. Allusion has already been made to such as agitate the water. Where the simple action of an exhaust force is sought, the only point is to have the material, of which the barrel or pipe is composed, such as will not, itself, defile the water. Wooden pumps often become very objectionable, because of the decay and the taste of the wood. Stone or burnt tile pipes have sometimes been found very satisfactory. Where metal is used it must be such as will not injure the water or too much affect the taste. Lead tubing is not recommended, as it damages some waters more than others. Where lead is constantly in the water, or where the service-pipe is constantly full, it is claimed that there will be no action of the water on the lead. Iron in some form is extensively used for water-carriage. The tube through which the water is drawn should rest on a center stone and be made firm on the bottom. Many prefer a tube sealed at the bottom, with holes in its sides just above, so that no sediment is pumped up. The spout should have under it a shallow trough to catch all drippings, from the lip or end of which the water can run off, so as not to soak about the well.

We have been specific in detail as to the construction of wells, because so often the impurity of the water is the result of such neglects on the surface and the platform of the well, as foul a water otherwise pure and wholesome. Many of these suggestions apply equally to cisterns. When water suddenly becomes foul, if other water cannot be gotten in its place, none of it should be used for drinking until it has been boiled and aerated, by pouring from one vessel to another. Such precaution often prevents sickness. The well should be thoroughly cleansed and all possible sources of contamination examined. The removal of the water from the well not only gives a new supply running in, but agitates both the air and water, and gives opportunity to examine into the character of the inclosure and the streams that are running in. We know of a case of typhoid fever traceable to a well, in which a cleaning out showed foul streams running in from one direction, while on the opposite side the water was entirely good. It was a very dry season, and it seemed as if on one side the water level had reached some foul deposit in the ground, as no outhouse or cesspool was near. That such occasional drifts or unchanged deposits of foul organic matter, both animal and vegetable, do occur, is well authenticated.

As it now frequently happens that the water is introduced into houses from outside wells or cisterns by means of pumps, care must be taken that the tubes through which the water is drawn in its passage through the brick or other lining of the well, are well fastened and cemented. Cases occur where such metal tubes passing through the soil, make, on their outside, courses along which foul liquids gather and trickle into the well.

HOUSE FILTERS.

Sometimes water may become turbid by reason of innocuous coloring matter from recent rains, or from the color of the soil, as peat or shale, or may have in it some organic matter from some sudden cause. It is in such cases that house filters are sometimes used to advantage. We have already discussed the principles of filters in connection with cisterns. Several patent filters are in the market, of more or less value. They differ chiefly in the methods in which they make available the usual filtering materials and in convenience for their removal. Some of them are arranged so that the water filters upward through them,

such as the syphon and pipe filters. Wool and canton-flannel will separate much of the grosser material, and answer well for a first cleansing, so that the water may be readier for the action of more thorough filtration. Layers of coarse gravel, finer gravel, coarse sand, finer sand, and charcoal, in about equal proportions, form the basis of most house filters. Parkes speaks very highly of filters made from spongy iron and from the magnetic carbide of iron. "On the whole," he says, "a very purifying effect is produced even on dissolved matters." Since the bacterial hypothesis has come in vogue, it is claimed that the smaller forms of vegetable or animal life are not destroyed. But these are mostly ephemeral in their life, and water not intensely fouled, that has been thus treated, has not yet been proven to contain any specific varieties. While usual potable water should be too pure to need filtration, these domestic filters may be very valuable as temporary expedients.

Now that so much attention is given to public and private water-supply and so many investigations are being made by competent men, the use of unhealthy drinking water is a fault before it is a misfortune, and arises far more from carelessness, ignorance or lack of forethought than it does from necessity. This is as true in public as it is in private supplies. It is seldom that a case of contamination happens but that it reveals an absence of proper vigilance.

HARDNESS OF WATER.

"Lime salts are the chief cause of hardness in water; compounds of magnesia, iron, and other elements, however, may contribute to that soap-destroying power of the water, which is practically meant by the term. Chemists recognize two kinds of hardness: 1. Temporary, which is caused by the presence in the water of those elements held in solution in consequence of the presence of carbonic acid. By boiling the water, the carbonic acid holding them in solution is driven out, and the compounds in solution in consequence of its presence, separate in the solid form, and can be removed by filtration. 2. 'Permanent' hardness, which is caused by the above bases, which are in combinations not converted into the insoluble form by boiling—sulphates, chlorides, etc., chiefly the first named. The temporary and permanent hardness together constitute the 'total hardness.'

"To express the hardness in some tangible form, the usual custom in this country and in England is to give results in the corresponding amounts of carbonate of lime, *i. e.*, practically to determine the amount

of soap destroyed by a measured quantity of the water, and then to state the results as the amount of carbonate of lime which would destroy that quantity of soap."

Thus water which does not form a suds or lather, curdles, and so wastes the soap. This curd is a precipitate formed by the combination of the soap with the lime and magnesia in the water.

"The hardness has much significance upon the economic side. Hard water is objectionable for domestic purposes, in washing, and for manufacturing purposes in boilers. Linen cannot be washed with hard water, and other materials not as well as with soft water. With regard to its effect upon health, the English Commission took a great deal of testimony. (Sixth Report, pp. 184 to 194.) One witness said that soft water was more conducive to health, as people were more apt to be cleanly when they had soft water to use; another that lime-sulphate in the water appeared to disagree with some persons; another that the death-rate was apparently a little lower in towns supplied with moderately hard water. About ten to fourteen degrees of hardness per gallon (fourteen to twenty per hundred thousand), was deemed by some to be beneficial. The question of the connection of the hardness of the water with the death-rate was investigated, and from numerous statistics taken in the United Kingdom, it was found that there seemed to be no necessary connection. The conclusion of the commission was, that though there were some differences of opinion 'there is almost absolute unanimity as regards the wholesomeness of soft water.' Popular prejudice runs in the same direction, especially when comfort in washing, and economy of soap and boilers are taken into consideration, while for sanitary purposes no objection can be urged to the use of soft water, other things being equal."

As all the water in the limestone regions of this State, and much of that in the red sandstone and some in other parts is hard, we need to be fully aware of its effects. Boiling removes the temporary hardness, but not that known as the permanent hardness. A process known as the Clark process remedies the former, but not the latter, and so becomes a test between the two. This permanent or unremovable hardness, if of much amount, renders the water undesirable for drinking purposes, although it can be reduced by carbonate of soda. The greater the permanent hardness the worse the water. By permanent hardness it is not meant that no chemical process will remove this hardness, which comes mostly from the sulphates (as gypsum, etc.) Distillation and sufficient quantities of soap or carbonate of soda will remove this. But the process is expensive and complicated, and so it

has been called permanent hardness, in contrast with that easily removable. Although most of our hard waters contain, in addition to the carbonates, some of the sulphates, yet when the former is removed they are greatly improved for cleansing purposes.

"Every degree of hardness means that one gallon of water contains one grain of carbonate of lime (common chalk); there are 7,000 grains in a pound weight; therefore, 7,000 gallons of water of one degree of hardness would contain 1 lb. of carbonate of lime, and that would waste 8½ lbs. of soap. But nearly all waters, except rain-water, are much harder than this, their degrees reaching 10, 15, or 20, so that if we were dealing with a water of 20 degrees of hardness, our 7,000 gallons would waste 170 lbs. of soap. This quantity of water would easily be used in a year by a family of say seven persons, if we include the washing of clothes, so that, with soap at only *3d.* a pound, we have a pure loss of *43s.* per annum in this item alone, or an amount equal to the income tax upon £100. There is also to be added loss caused in cooking, making tea, &c. For persons who get their living by washing, the importance of using soft water is very obvious."

AS TO THE REMOVABLE HARDNESS.

"To determine whether water is hard, we take a gill or thereabouts in a flask and add to it a clear solution of soap in alcohol. If the mixture is then shaken and remains clear with an abundance of soap bubbles over it, the water is soft, but if it becomes white, and curdy-looking masses form and float in it, and no bubbles appears on the surface, it is hard water.

"The hardness is caused by salts of lime and magnesia which are in solution in the water. These salts render the water unfit for washing, as they destroy soap, and they are troublesome in tea kettles and in steam boilers, on account of the incrustation which is formed as the water boils away. But hard water is not specially unwholesome, and it is common to find well-waters containing from 10 to 60 or more grains of solid matter to the gallon, which have been used for years without any injurious effect, though sanitarians recommend that water containing more than 17 grains to the gallon be not used.

Hardness implies one grain of bi-carbonate or sulphate of lime in a gallon of water. Water at or below six grains of hardness to the gallon is not objected to. The report of the State Geologist makes ten grains of hardness to the gallon the limit. Whether the removable hardness injures health cannot always be determined, but as it may cause dyspepsia, diarrhea and calculus, and adds a material not

needed for digestion or assimilation, it is better to use the softer water. The incrustation of boilers by hard water and, which is much worse, from the sulphate hardness, and the great wastage of soap caused by it, are worthy of great economic consideration. The water of Worthing, in England, for instance, is so hard that in one thousand gallons of water twenty-eight and one-half pounds of soap are destroyed or curdled before any lather will come. In the Thames water it is over two pounds, in that of Manchester only about three pounds, while in the Loch Katrine supply of Glasgow it is only two-fifths of a pound. It is easy to see that if such large amounts of soap are thus wasted, and if there may be some peril to health, the hardness of water should be considered in its introduction or remedied afterward. Water kept boiling about a half hour loses most of this removable hardness. Such water, poured on thin slices of well-burned toast, is found to agree with some who, from stomach or kidney disease, are susceptible to mineral ingredients. The Clark process, as described by Church, is thus carried out by the East London Company:

"Slake 18 ounces of freshly-burnt quicklime in a little water: when the lime has fallen to powder, add enough water to make a thin cream with this powder, and stir the mixture in a pail. Then pour this cream into a cistern containing 50 gallons of the water to be softened, rinsing the pail out with more water, but not pouring out any lumps of lime that may have settled. Let into the cistern the remainder of the 700 gallons of water which 18 ounces of lime can soften, and take care that a thorough mingling of the water and lime occurs. The added lime seizes the carbonic acid gas which held the carbonate of lime in solution, and so both the original carbonate of lime and that formed in the process fall together as a white sediment. This takes some time to settle—from 12 to 24 hours—but the water may be used for washing before it has become quite clear. This process is carried out on a large scale at Canterbury, Tring and Caterham. At Canterbury 110,000 gallons are softened daily by the addition of 11,000 gallons of lime water, the total impurities of the water being thus reduced from 23½ grains per gallon to less than 8½. And not only are hardening matters thus removed, but organic substances as well. The process purifies, to some extent, as well as softens; and the method is not only effective, but cheap. It would require 20¼ cwt. of soap, costing £47 1*s.* 8*d.*, or 4¾ cwt. of carbonate of soda, costing £2 17*s.* 6*d.*, to soften the same quantity of water which could be treated by Clark's process for 8*d.*, the cost of 1 cwt. of quicklime.

"The hardness of water is a great defect. Already we have shown some of the drawbacks to the use of a very hard water: others may

be named. In preparing articles of food by boiling them in water, we find that they do not get so well done in hard water as in soft; indeed, it is a good plan to boil the water first before using it for such purposes. Greens, boiled in hard water, acquire a dull gray color, as the earthy matters of the water are deposited upon them. If they are cooked in boiling water, which has also been boiled some minutes before, and especially if a small pinch of carbonate of soda and a little salt be added, this defect will be remedied. For making tea with hard water, it is allowable to use a little carbonate of soda, but a great deal too much is commonly employed. For cleansing the skin, hard water is not nearly so efficient as soft."

Thus we claim that all water extensively used should be tested both as to its total, its removable and its unremovable hardness. Where any other inorganic or mineral ingredients of water are suspected to be present in undue proportions, they may be detected by further analysis. In the cretaceous formations of the State, iron pyrites or copperas (sulphate of iron) are common, and the water often has a slightly astringent taste and blackens tea. Some of the waters are blackened by peat or by the cedar beds of some swamps. It has been claimed that the slight amount of iron and of cedar and pine present in some waters of the State exercise antiseptic powers and so prevent disease.

It is encouraging that there is in every part of the State so much attention now given to inquiry as to sources of water-supply. Yet it is evident that each family needs for itself to have a certain amount of knowledge as to possible sources of pollution. In the case of cisterns, springs, shallow or deep wells, we need to know that they are so made and used as not to expose them to contamination such as is generally an extra demand on the vital forces and too often causes actual disease and premature death.

ON FILTRATION.

PROF. GEORGE H. COOK.

By filtration, I understand the clarification and purifying of water for culinary and household use. The rapid increase in population, and the great number of manufacturing establishments, all over our Eastern States, is every year rendering the stores of water in the ground, and the streams which flow from the surface, and even the rain which falls from the clouds, more impure. Our well-waters, our lake and river-waters, and even our cistern-waters, are liable to be contaminated with impurities—some disagreeable, others dangerous, and all undesirable—and yet from one or other of these we *must* get our supplies.

How shall we accomplish this end, and at the same time get our supplies pure and wholesome? The answer, in general, must be, by filtration.

The term filtration is by some understood to mean only the straining out from a fluid such particles of floating solid matter as renders it roily or otherwise objectionable in appearance, while others understand by it the removal, not only of the solid floating particles, but also the substances which may be dissolved in it. The first can certainly be done, and the other only to a limited extent.

Water, to be wholesome and acceptable, should be clear and colorless; it should also be free from any organic matter, especially that which is of animal origin, but it is not necessary that it should be entirely free from mineral matter, such as the salts of lime and magnesia, which give the hardness to water. Hard water, even up to that containing fifty or sixty grains to the gallon, is not unwholesome for drinking, though it is very unfit for washing or for making steam. Water which is made hard by the presence of carbonate of lime, may be made soft by the addition of a proper quantity of quick-lime; but sulphate of lime, which causes the hardness in most of the waters of this country, cannot be economically filtered out or separated.

The natural filter of earth, through which the rain and surface-waters have passed to get into our springs or wells, is composed of the earth and sand which everywhere covers the surface. The water, as it descends through these surface materials, loses the impurities which have given color or opacity to it, and at the same time it dissolves and carries along with it more or less of the minerals it has passed through. Such is the water of our springs and wells when the country is new or thinly sttled. But, as more water is drawn from the wells, and the rain-water has to soak through, the surface impurities, which accumulate with increasing population, are carrried farther and farther downwards till finally the earth and sand will intercept no more of them, and the water passes in its impure, though possibly clear and sparkling state, to the wells, to become the cause of sickness with all its attendant evils. The surface-waters which formerly ran from mountains and forest lands, now run off from cultivated and enriched fields or from the roads and streets of towns and villages, and are still farther contaminated by the waters, impurities and filth which necessarily attend manufacturing processes. All these help to make the water in our streams more impure every year.

Many people still consider the well-water to be the best because it is clear and has the most taste, but the majority of people, especially in our cities and towns, take water from public supplies, which are mostly drawn from streams. Such water is liked because it can be drawn in almost unlimited quantities, directly where it is needed, without pumping or carrying. And, though not so pleasing in appearance, it is probably safer than the well-water. But both of them are dangerous, and something should be done to remove or diminish the danger.

In the case of water from streams, very little has been done in this country to improve its quality beyond what can be accomplished by having large reservoirs and allowing the water to stand in them some time, so that the matters suspended may settle to the bottom, and then to have a wire screen for the water to pass through, while fish or other objects, swimming or floating in the water, are kept back. The organic matters in the water are not removed. Such waters, when left to stand in reservoirs, undergo singular and disagreeable changes, especially during the warmer seasons of the year. Sometimes they have a musty taste and odor, some generate a fishy smell, while others are said to have a cucumber smell. It is not yet explained by what change these effects are produced. Fortunately, though disagreeable, they are not

generally dangerous. In some of them, as I have noticed, even boiling the water does not remove the peculiar smell.

In a case of stored water which came under my observation, where a most disagreeable and musty odor and taste was so strongly developed as to be extremely disagreeable, an attempt was made to correct it. The water, on close inspection, was seen to be just a little brownish in color and not perfectly clear. It obviously contained some organic matter. The reservoir of water was about eight feet deep and contained near 4,000,000 gallons. Two barrels or about 500 pounds of alum were dissolved in water and sprinkled over the surface of the water in the reservoir. In the course of two or three days a light scum of slimy coagulated matter gathered on the surface of the water, and was drifted by the wind to the bank. The water itself became perfectly clear and colorless, and its disagreeable smell and taste had disappeared, and this improvement in quality continued several weeks. A like trial has been made on two or three other occasions when the water had developed this disagreeable taste, and the effect was the same in every case. The alum was not sufficient to affect the taste, and I do not think that any one using the water ever suspected there was anything unusual in it. And when the very small percentage used is taken into account, I doubt whether it is possible to detect it by any easy test. Five hundred pounds of alum to 4,000,000 gallons of water, allows 1 pound for 8,000 gallons, or 2 ounces for 1,000 gallons, or about $\frac{1}{8}$ of an ounce for a hogshead of water, and if expressed in the ordinary form of chemical analysis, it would contain only .0016 per cent. of alum.

The trials with this substance are not sufficient to warrant the recommendation of its use, although it is probable that most of the alum is removed in the scum. Still, there may be some well-grounded objections to purifying water in this way. Some more satisfactory and regular mode of purifying water is still needed.

What are called natural filters have been taken advantage of in some cases with success. "Bordering upon all rivers there are found at intervals narrow plains of gravel or sand, brought down and deposited there by the river under the varying positions of its channel-way. When these beds of gravel extend to a depth below the bottom of the neighboring stream, they will always be found saturated with water mainly derived from that stream, and however turbid the water of the river, this underground flow will always be found clear, pro-

vided that we tap it at a reasonable distance from the channel-way." (Kirkwood on Filtration, page 17.) The water-supply of Newark was attempted by means of a natural filter of this kind. The pumping works are located on a strip of alluvial ground on the west bank of Passaic river, about a mile above Belleville. The surface is but little above high-water mark, and the basins are about 200 feet back from the border of the stream. Two basins were dug in this alluvial plain as deep as the water would easily permit, and they are each 350 feet long and 150 feet wide, walled up with vertical stone walls, and so deep that water will fill them to the depth of 8 feet. The filtration in this way was satisfactory, and the quality of the water was good. The supply needed for the city is from six to eight million gallons daily. At the present depth these basins will not yield that amount, and they have been obliged to open a passage-way from the river and allow the water to flow in without filtration.

It is to be regretted that a more thorough trial of this natural filter has not been made. The sand and gravel is 40 feet or more in depth, and if the basins had been sunk deeper, the filtration into them would have undoubtedly been much more rapid. The pumps are so set that they will not now draw water from much lower than the bottoms of the basins at their present depth, and to get a fair trial of any increased flow would require some new and differently-arranged pumps. In other cases, instead of open basins, long covered underground galleries have been constructed of dry masonry as far in the ground as possible below the surface level of the river, and the water allowed to filter through the sand and gravel of the alluvial plain into these, from whence it can be pumped up for use. The works at Lyons, Genoa, Toulouse, Angers and Pesth, in Europe, are of this sort, and are said to have been eminently successful in providing a good quality of water. The same plan has also been adopted at several places in the United States. At Lowell, Mass., there is a filtering gallery on the north shore of the Merrimac river, parallel with it and about 100 feet from its edge. Its length is 1,300 feet, width 8 feet and height 8 feet. At Columbus, Ohio, there is a long filtering gallery on the border of the Scioto river. It is a brick conduit, 36 by 42 inches, bricks laid close over the upper half and open in the lower. It is 5,715 feet long, and is said to be one of the best examples of this mode of supplying filtered water. The same plan of construction has been followed in the works at Taunton, Mass.

The daily supply from these galleries must, obviously, be varied with their depth below the surface of the water in the river; increasing with the increase of depth. The European works of this kind, which are cited from Mr. Kirkwood's notes, gave a daily supply from each square foot of their bottom areas of 288, 147, 300 and 182 gallons, respectively. If the Newark basins had supplied water at the rate of 147 gallons daily per square foot of bottom surface, they would have furnished more than 15,000,000 gallons daily—but it is probable that these short and broad basins will not collect the filtered water as rapidly as the long, narrow ones—and their depth is not sufficient, at low tide, to cause any rapid inflow of water. The borders of the Passaic at these and at other places above Belleville, offer fine locations for these natural filters.

In the majority of cases where filtered water is needed, natural filters cannot be found, and resort must be had to artificial filters. The alarming and fatal effects of impure water during the visitation of the cholera in Europe (1849 and 1850), led to a thorough examination and condemnation of the unfiltered water supplied to cities, and to the compulsory construction of artificial filters in cases where polluted waters had to be used. They are now to be found in most of the large cities of Europe. The following description of a filter-bed is taken from Nichols' Water Supply, Chemical and Sanitary, p. 151. "Filter-beds, as usually constructed, are water-tight basins, some ten feet or more in depth, the sides built of masonry, and the bottom puddled or paved with brick and cemented. The area may be from 20,000 to 50,000, or, in some cases, even 150,000 square feet. In building up the filtering-bed, provision is first made for the ready collection of the water, by constructing, upon the floor of the basin, drains or channel-ways of stone or brick, laid dry; then follows a layer of broken stone, the fragments being three or four inches in diameter. This is succeeded by gravel, screened, so as to be of uniform size, a layer of coarse being followed by one or more layers of finer material; upon the gravel rests sand, likewise separated into layers of uniform size. The exact thickness of the different layers, and the extent to which the separation into the different sizes is carried, are subject, of course, to considerable variation.

"The water stands several feet deep over the surface of the sand, and is allowed to flow down through the filter at such rate as experience shows to be most advantageous. Naturally, when the sand is

clean, a greater quantity of water can be passed in a given time than when the sand has become clogged; practice differs as to the maximum rate, but it is seldom over six inches, vertically, per hour, and often less. At the rate mentioned, each square foot of surface would deliver 12 cubic feet (or 89¾ U. S. gallons) per day.

"When the beds become clogged so as no longer to filter with sufficient rapidity, the water is drawn out from them, and the upper layer of sand, for a depth of a-half or three-quarters of an inch, is removed. When, by successive parings, the thickness of the sand has been considerably reduced, that which has been removed is washed and replaced, so as to restore the original thickness; the waste of washing being made up with fresh sand."

With strict attention to these filter-beds, and the frequent removal of any impurities which collect on the surface of the sand and in its upper portions, these filters have met the requirements of sanitary bodies fairly well; but, when neglected, the effects are soon felt in the bad quality of the water.

Filter-beds have been constructed to filter the water supplied to the cities of Poughkeepsie and Hudson, New York, and they are working satisfactorily. Their general introduction is to be desired. And the expense and want of experience in their management, are probably the causes for their coming but slowly into use. Three filter-beds of 50 by 100 feet each, should be able to supply 1,000,000 gallons of water daily, and, at the same time, allow the cleansing of one of them to go on whenever necessary. The cost of such filtration has been estimated at from $6 to $11 per million gallons.

WELLS.

The water in wells is really filtered through the over-lying and surrounding earth. It becomes impure from the saturation of the earth with the impurities from manures, waste and refuse matters thown on the ground, and still more from sinks, cesspools and privies, which are so constructed as to allow their contents to sink into the earth. Such sources for pollution should be avoided, as far as possible, and the wells should be stoned or bricked up and the lining made water-tight by the use of cement mortar, so that water from near the surface can be shut out and only that from the very bottom allowed to enter. Where water enters from the sides of the well, and

there is any considerable depth of it, that at the bottom is likely to be freer from organic impurities than that near the surface, and it will be better if drawn from the bottom by a pump than from the surface by a bucket, though the latter will probably taste the best from its being better aired. The water from drive wells is safer than that from dug wells, on account of being drawn from a greater depth beneath the surface of the underground water, and, so, less likely to be contaminated with surface impurities.

RAIN-WATER.

This is liable to be contaminated by gases absorbed from the air, by dust and dirt which accumulates on roofs, and by the smoke which escapes from chimneys. It is usually soft-water, and the impurities, though disagreeable, are not dangerous, and when the water is collected in cisterns, which are securely covered so as to keep out surface-water, they furnish a safe supply for domestic use. Cisterns should be deeper than they are usually made, and more capacious. They would fill with cold water during the winter, and as the summer rain is warmer, it will remain on top of the winter water in the cistern, and if there is any overflow it will be of the warm water and not of the cold. In this way cistern water can be stored so as to be always cool, and from its low temperature it is nearly free from any changes which the organic matter in it might undergo at the usual summer heat. Filtering, however, improves rain-water. It holds back some of the impurities and leaves the water clear and bright. Filters for rain-water are made in a great many ways. They have been made of sand, of charcoal, of animal charcoal, of oxide of iron, of porous sandstone, of unglazed brick, etc. The filtering substance being placed in such a way as to require the water to pass slowly through it before being drawn out for use. A solid brick wall, laid carefully in cement mortar, makes a good filter. The bricks should be rather under-burned, and extending through from one side of the wall to the other, and the faces of the wall not covered with mortar. Water will filter through such a wall fast enough for the supply of a family, and if the rain all enters the cistern upon one side of the wall and is drawn out upon the other side, the water is clean and sufficiently pure. The storing of pure water in this way, for drinking, is worthy of more attention than it has received, and the quantity which can be stored from roofs is sufficient for all family use.

Wherever only unfiltered water from streams or wells or cisterns is to be had, its quality may be much improved by passing it through the small filters which are prepared for household use. There are great numbers of these, and it would not be profitable to discuss their merits at this time. The common bag of cotton flannel, or flannel, tied on the faucet of the water-pipe will greatly improve the appearance of drinking water, and will strain out many disagreeable objects. A tube or box with sponge in it will also be satisfactory in clarifying turbid water, and like the bags it is easily and quickly washed and replaced. Granulated animal charcoal in boxes or vessels where the water can filter slowly through it, improves its appearance and quality. Some of the best house filters are made essentially of this substance. Vessels having in them and near the bottom horizontal partitions made of porous brick or sandstone, so that the water can filter slowly through, and be drawn off below, serve a very useful purpose.

There are many filters for clarifying water for manufacturing purposes; their action is mechanical, and their description would be out of place here.

While the benefits arising from the filtration of water have been proved by many satisfying experiments and experiences, the chemical or mechanical changes which it undergoes are not well understood. By some, the changes which it undergoes are said to be due to oxidation, that is, to a chemical combination of the impurity with oxygen from the air, by which the original is destroyed and some new and harmless one is produced. Every chemist knows that substances which are porous or in fine grains have the power of attracting air or oxygen to their surfaces, and in the case of the porous substances, the amount absorbed is equal to a great many times the volume of the porous substance itself. This is notably true of animal charcoal, but it is very observable in sand or in fragments of glass. The organic matter in water, though it may be very active and dangerous, is in extremely small quantity, so that the amount of oxygen needed to consume it is very little. When the filters cease to act it is said to be because the oxygen on them is exhausted, and if they are taken out, cleansed, dried and put in their places again, they act as efficiently as at first. This explanation is plausible, and, though not entirely demonstrated, it applies to the known facts more closely than any other. Numerous chemical examinations have been made of samples of water before and after filtration. They generally show a small diminution

in the amounts of organic matter, but not by any means sufficient to explain the changes which appear to have taken place in the properties of the water. The dangerous effects of organic matter in water are due not so much to its quantity as to its quality. It may well be that in the process of filtration its dangerous properties are to some extent destroyed, while the elements of its substance still remain. This explanation seems consistent and may be accepted till some better one is found. The sanitary benefits of the filtration of water are so well sustained by experience, that we must advocate the adoption of plans for that end wherever water that is liable to contamination is used.

NOTES ON POPULAR HEALTH RESORTS.

BY THE SECRETARY OF THE BOARD.

The sea-coast of New Jersey has not only become the most popular resort for the American people, but has so rapidly increased in permanent residents as to have cities and towns and villages which have an increasing population each year, and which are destined to grow as rapidly as towns in other portions of the State. Indeed, some of them have already so far established their claims as serviceable for winter resorts as to assure a sustained population of this class, even although as to individuals it may be transient. Both as a material interest of the State and as a care of the public health, the Board early recognised the duty of a close and accurate observation of all places offered to the public as having sanitary inducements. We claimed the duty of close inspection, of apprisal of those pecuniarly concerned as to defects either through carelessness or ignorance, and of report to the public if these defects were not remedied. We believed that while owners should not be hastily attacked, and while no sensational statements should be made, the policy of long concealment should be ignored. No one can realise as do members of this Board the need there was of such examination and advice, and the results which have been secured. We can point to place after place where our first visits were occasions of persuasion, of protest, and sometimes of local denunciation, but where Health Boards, and often owners, became convinced of the correctness of views expressed, and proceeded, with greater or less speed, to remedy the evils complained of. For any health officer, a sanitary inspection along the coast to-day is in most cheering contrast with the experience of six years ago. Not that all was then bad, or that all is now good, but there has been a great increase of intelligence as to necessity and methods; and there is a general determination to have the sanitary arrangements complete. This has not been merely as to the most leading and vital concerns,

such as good water-supply and proper disposal of all refuse, but has extended to questions of drainage, of filling in, of ventilation, of housekeeping, and of the proximity of stables, slaughter-houses, pens, etc., to residences.

While eternal vigilance is the condition of health, and while the time will never come when the inclinations to filth and negligence will not need to be watched in all places where multitudes arrive hastily, stay for a while, and then as hastily depart, yet we feel assured that each year will witness more and more attention to the details of sanitary construction and administration. No doubt some contractors will still dare to cover over wet and boggy lands with sea sand without drainage, to build houses on the "scamping" system and to make a great boast about the concealed sanitary appliances. But we are now quite sure that their sin will find them out, and that it will not always be necessary to wait for an endemic or an epidemic to reveal defects. Hotel after hotel along the shore has had its sewerage and plumbing reconstructed. Pipes filled with solid grease; traps rendered useless by solid matter, by water evaporation or by syphonage; the soil about wells saturated with liquid compost, and other revelations made before their eyes, have quite convinced Boards of Health and owners that there must be a forsaking of imperfect methods, and that it pays to secure the best workmanship.

We can now point to many a hotel and boarding-house in the best of sanitary order, only needing good administration to secure its complete healthfulness, and local Boards so intelligent as to sanitary construction as to enter their protest if they see imperfect works in execution.

Beginning at the most southern resort, Cape May Point well illustrates some of the changes wrought. Nearly two years since, an examination there showed great imperfections by reason of hasty sanitary arrangements, and it was believed that only the newness of occupancy had saved, especially the winter and spring guests, from ill-health. The defects were promptly brought to the attention of the Land Improvement Company, which owned the property. After full inquiry, it was resolved to spare neither pains nor expense in providing for the hotels and for the town a system by which all debris from persons or from necessary culinary and household methods should be promptly removed. Proper ventilation was provided for inside closets and vents, to prevent the syphonage of traps. Pipes well laid in cement

and properly separated, carry all liquids to a large tank a long distance from the town. The fall not being great, several flush tanks are provided, which, while they secure adequate flush, have advantages over that kind of construction in which the flush is made by the foul liquids themselves. Grease traps are so built as to separate the grease, and thus still more secure the cleansing of the pipes and the purification of the liquids. The receiving tank or reservoir is closely cemented, an inner wooden curb being used, because of the looseness of the soil. Each day this liquid is pumped out by a small steam engine especially arranged for the purpose. This carries it to such parts of the large tract of land owned by the company as will allow them to adopt a system of intermittent irrigation. While this has not yet been perfected, and some questions of economical disposal are yet to be settled, the system itself, so far as the town is concerned, assures thorough removal of all fouled liquids, if only the administration is accurate. It is always to be borne in mind that the more elaborate the structural methods are, the more risk there is, if there is no overseer or if the engineer falls asleep and forgets to run the machine. But this town seems at present under more efficient management, and there is every reasonable prospect that it will become a favorite resort for winter and spring, as well as for the summer. The irrigation field will, however, need and must early receive attention, or we cannot call it complete.

Cape May City.—Extended improvements have been made during the last year at Cape May. An efficient Board of Health has impressed upon hotel proprietors the fact that a good system of sewerage will not atone for household neglects. Here and there we meet a boasting hotel owner who assumes he understands all about it. Defects are far more noticeable in such hotels than in those where owners have no sanitary devices of their own, but on so expert a question consult good plumbers and such members of Boards of Health as have made special study of sanitary matters. As a rule, every hotel owner should have a competent plumber each fall and spring to examine the entire system of inside pipes, and to put all in working order. Of course, stoppages are always attended to. Not so with leakages and other defects. While the outlets of the sewers of Cape May and the creeks made available thereof, need good sanitary oversight, there is no reason to believe there is any defect in the tides and ocean current, which carry all outflow far away. Yet the depth and incline of outfall

should be watched, and examination had as to any precipitation of sewage in these creeks, for while not now disturbing, it might eventually much affect the gradient and the flush.

Atlantic City.—The value of the water-supply is more and more appreciated. Where people go for health, rest and comfort, they should not be exposed to clouds of dust. So an abundant water-supply has to do with health in this respect, as well as for drinking purposes. This city, like several others, needs to be correcting the relations of the streets and of dust to health, and, by more extended system of watering, to be providing therefor. Last year it was announced that full arrangements had been made for an adequate system of sewerage. Owing to some delays on the part of the company, little has been done. A speedy completion of a system is now being pushed forward. We are glad to recognize that the local Board and its assistants have redoubled their efforts, and that a system of inspection constantly seeks to secure removal.

So long as human nature is no better along the sea-coast than it is in the middle or mountain districts, so long will crowded hotels and houses find it both troublesome and expensive to cart millions of gallons of fouled water a-half mile or a mile away. To avoid it the cesspool will be built, and the more it leaks the more it will be applauded, since there is so much less to cart. The only limitation will be that its overflow will be prevented, and that the soil or ground around will postpone the evil day, so long as, without croppage and the usual mode of appropriating organic decay, it can dispose of the suspended filth. But we have abiding faith that property owners and citizens will not abide this, and will show that any town is hospitable to its guests in protecting them from unseen dangers, as well as in providing fresh air, good food and pure water. Cities like this should compel property owners to use the sewers, when built.

Sea Island City, between Cape May and Atlantic City, and several smaller localities, have been chosen for development and give good promise of success. While it is impossible to visit all these, and many are only represented by a hotel and a few cottages, we have enough information as to them to show a determination to secure good sanitary conditions. Hotels, at such places, are now generally built by those understanding much as to sanitary construction, and mistakes are the exception rather than the rule. Yet it is known to us that occasional cases of local sickness occur, fairly attributable to incomplete sanitary arrangements.

Beach Haven is situated near the lower end of Long Beach, between Barnegat bay and the ocean. It is a quiet and popular resort. Before there is much increase of population, there is great need of some grading of the streets and proper provision for the discharge of surface-water. As it is, with the general low level, the proximity of meadows, pond holes and stagnant water are sure to detract both from beauty and healthfulness. The water-supply is, thus far, very safe, since it is rain-water collected from clean roofs and filtered through the partition walls of cisterns. Garbage seems to be carefully collected and disposed of. There is little or no dependence on cesspools, but all closet material is conveyed by terra cotta pipes to the bay. While it cannot be claimed that, for a time, so large a body of water is likely to be polluted, the flow requires care and watchfulness. Some of the in-door appliances have imperfect flushing of water and of air. So good a location needs a little more skillful sanitary oversight—not so much because of any present peril, as for security in the future.

The same remarks apply to several small places between Atlantic City and Sea Side Park.

Between this and Manasquan, Berkeley, Bay Head and Point Pleasant, are each attending with carefulness to sanitary matters. Chief defects are in inefficient drainage before filling-in low places, or in the attempt to make or to enlarge lakes where the surface pond does not justify that impounding of water and destruction of natural drainage which occurs where the pond is thus artificialized into a lake. Some of the so-called lakes along the coast should be drained or filled up; others should be reduced to their natural dimensions, and just a very few of them are to be cherished as consistent with good drainage. Some of these towns necessarily depend upon cistern water-supply and cemented outhouses. A summer inspector and a regulated scavenger and garbage removal do much to diminish risk, and we are glad to know that in some of these towns these temporary methods are efficiently maintained.

A careful examination has been made of all the localities between Manasquan and Ocean Beach, inclusive. These all fall under the general oversight of one Board of Health. Some defects in and about Manasquan, have been brought fully to the attention of the local Board.

The new locality of Brielle, near there, needs some attention to sur-

rounding drainage. The hotel itself relies upon a cesspool, with some slight improvement in general arrangements. The hotels under the control of one company, which include all the coast to a little beyond Spring Lake, were found, with a single exception, in good condition. This, there was every assurance, would be speedily remedied. The cottages have to depend more upon skilled administration, as generally they are not able to bear the expense of many constructive arrangements.

Some of the boarding cottages at Spring Lake have very complete sanitary arrangements. Most of the hotels on this part of the shore depend upon the dry and prompt disposal of all excretions, and convey slop-water to a distance from the premises or to the sea.

The filling-in now taking place between the Parker House and Spring Lake, and the effort to reclaim some of the land, seems to promise success. The subsoil of sand is covered with loam, and we are assured that attention will be paid to drainage and that the lake will not be made to overflow its natural bottom.

The plan at Spring Lake and the adjacent hotels contemplates a pipe system, by which there shall be removal, to a considerable distance, of all liquid refuse.

Brighton, just beyond Spring Lake, is well located. The sewage of its chief hotel finds exit into the sea.

At Ocean Beach, better attention than heretofore is given to sanitary administration, but there are still some defects. There has been a want of co-ordinate action and some meagreness of expenditure not in keeping with the commanding situation and the many natural advantages. Two of the prominent hotels are very defective in sanitary arrangements. The largest hotel presented a favorable contrast and seemed under good administration. It has arrangements for forcing the fouled liquids away from the buildings and for discharge into the sea. We since find that the hotels most to be complained of are outside the limits of the association.

Key East is a new locality which is being improved with great enterprise. Parts of it are not well adapted by nature for dwellings closely arranged, but if in the filling-in and the drainage are properly cared for, this can be overcome. Speculation does so much to please the eye, and is so apt to slight what is out of sight and yet indispensable to health, that it is wise closely to watch all new localities, many of which are presided over by engineers very competent in levels and

landscapes, but not informed as to the sanitary necessity. This does not at all apply specially to this locality, but is a warning needed not only along the coast, but at many points inland. We have found that the engineer here is intent upon thorough work. The emptying of the sewage into Shark river is not advisable, except under a closely supervised method.

Ocean Grove has a local Board desirous of the most thorough sanitary administration; while for a time defective in realizing or enforcing necessary changes, it has done a great deal of excellent service for the two past years. The artesian wells seem to be a success, and the supply of water is abundant. Important repairs have been made at the ocean end of the sewer system.

The plan is that of constant discharge into the ocean, arranged at a depth and at a distance under water to prevent any return.

Other resorts, such as Asbury Park, which trust to the ocean as the great reservoir, have intermediate close tanks near the shore to receive the fouled liquids from the sewers, and then at night, or at proper intervals, empty into the sea with the outgoing tide.

The question, Shall the sewage enter the sea, and, if so, how? is still under trial. It is a relative question. It is surprising to see how the practical answer, thus far, seems to vary along the coast. We know of one point where all garbage and floating material was carried on the beach of an inlet three miles or more from a city. Yet, a severe storm, which washed up the inlet and over its shore, brought down to the sea-beach of the city enough of cut lemons and other floating material to convince observers that at that point it would not do to conduct the foul materials into the sea.

At other points, for years the liquids from hotels have gone into the sea without the least ground of complaint. It is found, too, on sounding, measuring, or by other examinations, that while at one point the undertow is always out enough to carry everything away, at other points it is not. The same place changes somewhat in the course of years.

With such facts before us, the determination of whether any given place shall send its sewage to the sea, and, if so, whether directly by constant flow, or indirectly by intermittent or flush tank discharge, is a matter of close expert testing and careful local observation. We have had under careful inspection Ocean Grove and Asbury Park, and a few other places. We believe at these two places, and in the

case of one hotel at Long Branch, the outflow thus far has been fully successful.

As these outlets into the sea are usually tide or water-locked, and as there are other reasons, also, great care should be exercised as to the ventilation of sewers. While water-flushing is valuable as a mechanical motor, and to some extent as a pneumatic process, we need, also, the introduction of flowing currents of air at frequent intervals. Whether this shall be done by alternate openings high in the air, or just at the top of chimneys, or by street openings, is also a varying question. If sewers are well ventilated and are kept clean, and the houses or house connections are in good order, there is no reason, save an æsthetic one, why all sewers should not be built with a continuous open grating. But if sewers do become fouled, of course there will be odors from them. To this Mr. Simon has replied—if so, all the better, since such a warning odor is not likely to harm any one, if accepted as a proper and timely notice served on the proprietors to remedy the evil.

Both Ocean Grove and Asbury Park have signal advantage in that the ownership of land is such as to give the association of the former and the chief proprietor of the latter great facility in enforcing the laws, as well as great power of personal advice.

In Asbury Park, Mr. Joseph Bradley has, with wise foresight and intelligent appreciation, co-operated with Dr. Henry Mitchell, with the Health Inspector, and with other members of the Health Board, in measures for securing thorough sanitary construction and administration. Local separating methods, ventilation, flushing, etc., have been applied to the sewer system, and where questionable plans have been tried they are watched and abandoned or modified as skill and experience may indicate. The rapid ingress of population and a summer invasion as of an army in fatigue suit, make it necessary to adopt a discipline like the sanitary police of a camp. While no place on the coast requires more of wide-awake, portable and adjustable sanitary service, we believe that it is and will be found equal to the necessity.

Long Branch, with all its sanitary delays, shows some marked improvements. While some of the large hotels have still rows of cesspools, they are kept in better condition than formerly. Still it must be claimed that this large and growing constituency has not equaled expectation in its efforts to provide a system of sewerage,

which is very much needed. The Board of Health is faithful, and with intelligent oversight will finally convince the people of the policy of more complete sanitary construction.

An important conference of shore Health Boards was held in December, at Long Branch, which showed how ready the various Boards are to co-operate in the health care of our sea-side resorts.

The series of towns stretching from Long Branch to Sandy Hook are among the most attractive along the coast. Not only is the frontage along the sea capable of great attraction, but such rides as that from Sea Bright to Red Bank, and by the main road to Long Branch, afford a picturesque variety and a beauty of landscape, and of artistic adornment, which gives new charms to all that section. Monmouth Beach and Sea Bright, and several prominent hotels between these, or nearer to Sandy Hook, are but examples of a still widening future population. The Heights of the Navesink, Atlantic Highlands, etc., add to the other an extended and charming view over the New York bay. The sail from New York City, these delightful coast views and sea fronts, and the excellent attraction of the homes and residences will ere long lead to a population of wealth, of influence and of permanency which will add much to the resources of the county and State. The time has already come when there should be a full response to plans for wide-extended improvement. A careful survey of the whole section by the Board, convinces us that it is highly politic to protect all this region from any possible nuisances, and so appreciate and protect its health interests as to secure for it that perfection of rural homestead and elegant mansion, for which it is so eminently fitted. But, unfortunately, the Upper Shrewsbury river is itself fast becoming a nuisance. It is so convenient a receptacle for sewage, and is so valued as such by each individual proprietor, that most of such seem incapable of conceiving that just the little that they pour in can do any harm. It is forgotten that the aggregate is large, and that rivers differ greatly as to their capacity of disposing of sewage. Given a river with stony or gravel bottom, of deep water, of rapid current and of wide expanse, and with speedy entrance to the sea, and the water, the air and the sunlight will work wonders in clarification and purification in the distance of a few miles. But substitute in its place a shallow, sluggish, outspread stream, where every steamboat stirs the bottom mud, where the water is just brackish enough to precipitate the sewage in part, and where an abundant

growth of some aquatic plant is able to detain within its meshes the organic matter, and you have conditions just the opposite. Indeed, you get not only results from the sewage, but the aquatic growth also undergoes its forced and unnatural changes and becomes a factor in disease.

A degraded type of malarial complication often appears with the class of fevers and ailments more directly resulting from household debris, and so there is not only confusion of diagnosis or of treatment, but the system seems unable to cope with the hybrid diversity of attack. It is true that so far but few evil consequences have been felt, although close observers who have been in that section for years, agree in noting a change. We beg to counsel those who have chosen this delightful section that they spoil not their own nests, but with an intelligent appreciation of present and future needs, they enter upon some comprehensive plan for the removal of all sewage and for a general improvement. For this the country might wisely contribute its aid so far as the river is concerned, since its own incomes therefrom would fully repay the expenditure.

It may be asked whether in defense of the general interests of the State and in the promotion of its development by inducement for those from adjacent cities to resort hither, it would not be wise to enact a law requiring all hotels and boarding-houses advertising for and receiving over a certain number of guests, to have a yearly spring examination made of their sanitary condition, for which a small consideration should be paid to the borough, town or city in which it is located. The principle of thus protecting or providing for the traveling public or transient guests, has been fully recognized in previous legislation. It is impossible for the State to provide for yearly and minute inspection of all these buildings. But what has already been revealed, both as to the great evils found and improvements made, as also the fact that all such large resorts need special supervision, would, in the opinion of this Board, fully justify the requirement of a system of skilled sanitary circumspection and certification each year. Thus all would be more fully assured and a new impulse be given to that wonderful growth which has already taken place, and which the attractions of the sea and of the various localities would render rapidly progressive.

SUMMARIES OF LOCAL BOARDS OF HEALTH.

BY THE SECRETARY.

Our correspondence this year with local Boards has been more thorough than ever before. They are becoming more informed as to their duties and as to their possibilities of usefulness. Even those that have occasion to meet rarely accept the fact of their organization, and have a better readiness to meet any sudden outbreak. Here and there a township has but little appreciation of what could be done to increase its healthfulness, and so pays for its neglect by having some extra cases of avoidable sickness.

As an introduction to the report of the year, we place a special report for Camden. Its Board of Health is imperfectly organized, and cases of death from manufactured diseases are not infrequent. The report will be found moderate in statement, exact as to facts and such as should lead to a most vigorous sanitary policy in the interests of that important and growing city. It will also be found in many respects a model for sanitary method and study in other localities.

From other reports we give various selections. Those having nothing of special interest, and not needing to be quoted from, are valuable to us as records of health conditions and as guides for sanitary suggestions. We commend this series of local reports to the careful attention of all Health Boards and Health Officers.

REPORT OF SPECIAL SANITARY INSPECTOR FOR CAMDEN, NEW JERSEY, 1884,

AS MADE TO THE NEW JERSEY STATE BOARD OF HEALTH BY ONAN B. GROSS, M.D.

In compliance with the request of the State Board of Health, I herewith present, as Sanitary Inspector, the following report:

SCHEDULE OF SUBJECTS.

A—Location, geology, topography, climate and population.
B—Streets and houses.
C—Markets and manufactories.
D—Public buildings and schools.
E—Slaughter-houses and diseases of animals.
F—Cemeteries.
G—Refuse and garbage.
H—Water-supply.
I—Drainage and sewage.
J—Public health laws and sanitary expenses.
K—Vital Statistics.
And a general summary.

A—Location, Geology, Topography, Climate and Population.—The city of Camden is situated upon the east bank of the Delaware river, in the county of Camden. In contour it is elongated, extending north and south a distance of twenty-nine squares, east and west twelve squares, counting only the built-up portions of the city's extent. It is bounded on the north by the Delaware river and Cooper's creek, on the east by Cooper's creek and Haddon township, south by Haddon township and Newton creek, and west by the river Delaware. Its area is six and one-half square miles. Though its geological structure is slightly diversified, it in the main is represented by the sandy loam soil with underlying strata of clay and gravel.

The surface does not present any steep grades or elevations, and may be accepted as a typical, level-built city throughout, with a varying altitude from its tide-washed marshes to perhaps a mean height of twenty feet above tide-water.

The climate is mild and temperate, and in the main delightful and healthy.

The population includes representatives of nearly every nationality, but is mostly composed of the native-born element. The first four wards of this city are largely populated by a class of citizens—*i. e.*, merchants, manufacturers and mechanics—who, like the crows of West Jersey, "come home to roost," while crossing the river daily in pursuit of their callings. The number of residents of Camden who have their business interests located in Philadelphia is perceptibly increasing. The admirable system of ferriage between the two cities, and the many advantages of a residence here to such business men, is

having a marked effect upon the increase of population, especially in the better portions of the city. A fair estimate gives Camden a population of 45,000, as compared with the census returns of four years ago—41,658 (census 1880).

B—Streets and Houses.—The streets are of ample width throughout the city, with only a few scattered exceptions, and as a rule have right-angled intersections. There is such a natural and almost even grade everywhere in city limits, that grading of any consequence is required only in filling up marshy ground at certain points along the Delaware river, Cooper's creek and a large tract of meadow and marsh lands in the Eighth ward, known as Line ditch or Little Newton creek. About sixty per cent. of the building-improved streets are paved, and about fifty per cent. of the remainder are curbed and guttered. Most of the paving laid is cobble-stone, which, however, is gradually giving way to a far superior paving, *i. e.*, Belgian block, or in some cases rubble-stone. Several of the finest thoroughfares are laid with asphalt block, which is certainly a cleanly and smooth pavement, but not considered so durable as the Belgian pave.

The city ordinance relating to the cleaning of streets requires that the work should be given to the lowest bidder, who annually contracts to do the work at a cost to the city yearly of from $3,000 to $4,000; the said cleaning having reference mainly to paved streets. This work is usually done at irregular intervals by workmen with scraping hoes, who collect the dirt into heaps for removal with carts. Some of the better-paved streets are sprinkled, and the dirt collected into rows by wagon-sweepers. Brooms are occasionally used. The superintendence of this work is done by the contractor, and, by the present contractor, is done personally, which, to say the least, is a promise of good results.

The removal of ashes, garbage and slops is also a work done by contractors, who annually bid for the work at a cost usually of from $2,500 to $3,500. The collection to be made twice weekly, excepting in midsummer, when collections are made thrice weekly. The supervision of street work is a duty of the Sanitary Inspector, so far as relates to health measures, but is not rigorously enforced. (Refer to Schedule C—Refuse and Garbage.)

The houses of this city are mostly of the single family dwelling sort; but very few tenements of the multiple kind being found. The

construction material, for the most part, is brick, with occasional stone or marble fronts. An ordinance defining building within city limits prohibits the building of frame houses in the upper six wards. And another ordinance provides for the election of a building inspector, and defines his duties, which, however, requires his supervision of the material used and the mechanical construction of buildings, rather than the important work of the sanitation of new buildings, which work is not provided for by any act of city council. This is a serious oversight, and should at once be corrected. While it may be important for an inspector to see that a wall or joist has a certain dimension, it is infinitely more so to insist upon a good sewage and drainage of new buildings, for which no ordinance or enactment provides. (Refer to Schedule I—Sewage and Drainage.)

The number of buildings is now estimated at about 9,000, or one building for every five inhabitants. The increase is represented by the permits issued by the city clerk during the months of April, May and June, which number one hundred and sixty-three, which permits frequently call for the erection of a number of buildings on a single permit issued. Thus it will be seen that several hundred buildings are erected annually without the supervision of a disinterested official, so far as relates to drainage and sewage, and this matter is left to the builder and his plumber, and is too frequently a matter of dollars and cents.

C—Markets and Manufactories.—On account of the custom of selling meats, groceries and greens at small stores, there are but two market-houses in use in this city. The West Jersey Market is, in the main, a meat market, and receives its stock from a distance, with the exception of veal, of which about six calves are butchered weekly. The sanitary condition of this building is good, is under-sewered and the offal and refuse immediately removed. The Federal Street Market contains a few meat stalls, but is largely occupied by farm-produce dealers. This building is well drained and fairly cleanly.

It might be well to mention here the existence of a sealer of weights and measures, whose duties, however, do not include the work of inspection of edibles, which important work is left *undone* and entirely unprovided for. We have no inspection of edibles or milk.

The manufactories embrace woolen, worsted and ironwork mills and the making of steel pens, soaps, chemicals, paper and oil-cloths. A

few of the larger buildings, where the most workmen are employed, were inspected in order to learn their system of water-supply, drainage, etc., with the following results:

The woolen mills (300 employes) obtained drinking-water from deep-driven wells, and are well sewered. Found water in no danger of contamination.

Esterbrook Pen Factory (300 employes) was found in excellent sanitary condition and especially well ventilated. City water-supply.

Starr's Iron Works (600 employes) is supplied with drinking-water from a large magnesia-limestone spring on the premises, about 100 feet distant from any building excepting one large privy-well, at seventy-five feet, which the superintendent agreed to move seventy-five feet farther distant from the spring. Drainage satisfactory.

My attention has especially been directed to the hide, fat and tallow-rendering establishments of Baxter's, at Sixth and Kaighn avenue, and Read's, at Second and Mickle, on account of an unpleasant odor arising, during the summer especially. I found Baxter's establishment in fair sanitary condition, excepting the system of surface-drainage employed. One street bordering his place is neither paved nor guttered, and cannot drain anything upon its surface; and although this place, with its twenty-five years' existence, has been carefully managed, this objectionable feature should be remedied by draining this place into the Kaighn avenue culvert.

Read's establishment is underdrained and only objectionable on account of the odor, which seems inseparable from such a calling. "An Abattoir and its Drain," as a part of this establishment, will be referred to under Schedule E, with especial reference to its drainage.

D—Public Buildings and Schools.—Of the public buildings, there are but four requiring special notice.

The City Hall is well sewered, and stands at the head of the Benson street sewer, and on the water-shed line between Cooper's creek and the Delaware river, with an altitude of eighteen feet above tide-water line. The sanitary defects found were principally in the water-closet arrangement of the prisoners' departments. Of the twelve cells on the first floor, each 6x12 feet dimensions, all were provided with water-closets, one in each separate cell. Of the twelve water-closets, only one was found to work satisfactorily; ten were very imperfect, in having become broken, rusty or otherwise disabled, and one closet-

trap was choked, and the outflow was received upon the cell floor. All the closets were foul, and the emanating odors quite perceptible. The twelve basement cells were used principally as a lodging-room for tramps in winter; the cells contained only four or five closets that could be used at all, and they were also in a foul condition. The basement was also very damp and filthy.

The only remedy for this state of affairs in the prisoners' department, is to reduce the number of closets to a minimum and have them under the close and direct supervision of the janitor.

The Court House and County Jail occupy one and the same building. The principal sanitary defects found here have reference to the heating, ventilation, and the basement cell arrangement, water-closets and the handling of garbage. The twelve basement cells are stone-enclosed vaults, with a narrow door and grated window each, and built about five feet under ground, so arranged that one-half the number open into separate corridors, which are common receptacles for the prisoners at certain hours of the day. These corridors each contain a hydrant, bath-tub, water-closets, and a barrel-sized, galvanized garbage box, all of which were grouped at one end of each corridor. The sun rays cannot penetrate into these corridors, and the vaults are dark and damp as dungeons. At this time each cell or vault accommodates about three prisoners, or eighteen to a corridor, who, on escaping the noisome air of the cells, were obliged to breathe the gaseous emanations from the rusted and ill-working water-closet arrangement and the half-filled garbage boxes, which, while being emptied twice weekly, would have been less sour and disgusting to the smell if meantime they were furnished lids. But I think it barely possible for any plan to entirely relieve these unventilated cells and corridors of their noisome condition, excepting the one now proposed, "the removal of all prisoners from the basement to the upper floors, on the completion of the proposed new county building." The ventilation of the building is very defective, on account of its association with this basement filth. And one of the three large heaters located in this basement is lodged on a level with and between the two rows of prisoners' vaults. The air to be heated and distributed to the offices and court rooms overhead is taken directly from the corridors, and is no doubt a contributing cause of complaint made by occupants of the upper rooms of noxious odors being very perceptible on first entering their rooms in the morning. This might be obviated, to a certain

extent, by supplying this furnace, as the other two are supplied, with a box air-conductor; but this alone would not be sufficient, for the very reason that the court room and offices are too closely associated with the prisoners' apartments to be freed from their effluvia. And the proposed removal of the court and county officials to the adjoining new building is a necessity and a wise sanitary procedure, well calculated to abate this old-time nuisance of basement prisons in conjunction with public and, at times, crowded rooms overhead.

Attention was directed, by complaints, to the condition of the city's two largest halls. The first, Wildy's Hall, was found to be very defective in its water-closet arrangement, and Morgan's Hall had broken bell-traps under the streets. The promise of abatement of the respective nuisances was obtained in each of these cases.

The schools were closely inspected, and, for the sake of brevity, the result will here be given with reference only to the sanitary defects found. And as the water-supply for all the schools, excepting two in the Eighth ward, is obtained from the city reservoir, the only fact that need be mentioned in connection with this hydrant-water, is the universal use of bell-pipes to receive the waste-water, &c., which is certainly not sufficient, in the absence of the running drain-traps.

First District.—(1) *Cooper School.*—The underdrainage or sewerage is flushed by roof and yard rain-waters, and is fairly well arranged, and is deficient only in not having a small flush-tank as a protection in a dry season.

(2) *North-East School.*—Heated by steam through pipes well arranged. This school is the only one in the city thus heated, and is decidedly superior to all others. In fact, the portable heaters used in the schools are not provided with air-box conductors, and receive the air to be heated and distributed from the cellar, which, in some of the schools, is very deleterious, on account of the dampness and poorly ventilated condition of the cellar air.

The principal defect found here is the imperfect underdraining of the large privy-well in the yard, mainly on account of the drain-pipes entering the well too far above its bottom, and thus allowing a retention of from 12 to 15 inches of fœcal matter in the well at all times.

(3) *George Genge School.*—Light; ample, but not well-directed in two of the rooms.

Of the two large privy-wells in the yard, one was found partially filled with board and planking debris and very imperfectly underdrained.

SECOND DISTRICT.—(4) *E. A. Stevens' School.*—This cellar floor is not properly cemented, and objectionable on account of one of the four heaters in the cellar being a *portable,* and supplied with air directly from above the floor.

(5) *Central School.*—Heat ample, and supplied by four portable heaters; the cellar air, however, is not as objectionable as the preceding. Cellar well cemented.

THIRD DISTRICT—(6) *Richard Fetter's School.*—On account of privy-well in yard not having sewer connection, and the presence of a fœcal odor in the building mornings on opening, there is good reason for believing this drain not properly trapped. Indeed, the only evidence of any trapping of this underdrain was in the finding of bell-traps under hydrants in yard, and the traps of two water-closets in building. The rain-water conductors run into the drains and flushed them, and received the washbasin waste-water, also; each not supplied with any trapping, and it is no doubt due to this fact that the noxious odors are detected in the building. A running trap between the building and culvert is essential here, in addition to bell-trapping and S bending of all waste-water pipes.

(7) *Isaac S. Mulford School.*—Similar to Fetter's school, excepting odors in building not so easily perceived and yard not well graded. Broken bell-traps in both schools repaired during vacation.

(8) *Kaighn School.*—Light and heat sufficient; ventilation not sufficient. Odors prevalent in this building at times, owing to bad drainage. The two hydrant drains in yard were found choked. The water-closet in building not well flushed, and the drain-pipe in yard-well about one foot above its bottom. This drain needs overhauling.

FOURTH DISTRICT—(9) *Liberty School.*—Is in fair sanitary condition, and its method of underdrainage is worthy of adoption by all the other schools, especially in the construction of the yard-well, which really is the only properly-constructed privy-well in the yards of the city schools, it being a trough closet. Unfortunately, however, this drainage is run into one of the worst culvert systems in this city. *Vide* Tenth street culvert.

FIFTH DISTRICT—(10) *John W. Mickle School.*—The supply of water for this school has heretofore been taken from the dead-level of a water-pipe, but is now being corrected. A peculiar feature of the underdrainage of this building is that all drains are conducted into a large cesspool and privy-well in the back yard, which in turn is cleansed only every few years.

(11) *Central Avenue School.*—This is a small school of two rooms situated in the Eighth ward, and is quite primitive in its appointments. Light ample, though not well directed; heat, by ordinary coal stoves in each room; ventilation, by means of windows and doors only. The water-supply is taken from a pump-well in rear of building, which well is only fifteen feet distant from two privy-wells, which privies are only six feet deep, brick lined, but planted in such loose soil as to render their close proximity to the water-well very dangerous. The privies are cleansed every few years, but no method of cleansing can save the water from contamination.

Sixth District—(12) *Mount Vernon School.*—Light is sufficient, but not well directed. Heat obtained from two large brick heaters in cellar, is ample but is unwholesome for the reason that the heater air is obtained directly from the cellar, in which from January 1st to April 15th, this year, there was nearly two feet of water; often sufficient to put out the fires in the heaters. There are no water-closets in this building, and the two large privy-wells in the yard are underdrained into the Broadway culvert. This drain should be utilized for the drainage of the cellar of water, and it is possible nothing short of a culvert on Mount Vernon street will relieve this school of its very bad drainage, for this street is unpaved and the gutters are very filthy and offensive; and further, the culvert is now too far distant (half square) for an ordinary drain to keep the cellar dry, and run off all waste waters with the privy debris and other waters of the premises.

(13) *Ferry Avenue School.*—This school, like primitive Central avenue school, is beyond the limits of city water-supply and the culvert systems. Light good; ventilation by window and door only; heat obtained from coal stoves in each room; water is supplied from a pump-well eighteen feet deep in rear yard, about thirty-five feet distant from nearest privy-well. The water tastes very badly and is charged with visible organic debris. The odor of the water was far worse than the taste, *i. e.*, nauseous. This place is all surface-drained, and the four box-frame privy-wells in yard were in foul condition. The cellar is poorly ventilated and needed cleansing.

The ventilation of the schools, when not mentioned in above report, is by means of flues and windows. The flues have communication with rooms by means of small registers, and are not by any means reliable without the aid of some force in displacing the cold air in them by an upward current; and the best force is conceded to be

steam when steam is employed for heating purposes. There is but one school thus heated in Camden, and by its efficiency and superiority is worthy of adoption in all the other large schools.

Another ill-advised feature to be met with in our schools is the custom of rough plastering or sanding the walls of rooms and corridors. It is a means of arresting dust and dirt, and far inferior in cleanliness and purity to the smooth or whitewashed walls.

A reference to the sectional report, as just given, will show, however, that the most sanitary defects are found in the drainage of schools. A radical reconstruction in conformity with the principles of sanitary drainage is urgently needed. Here, even more important than in the drainage of private houses, are the services of a sanitary engineer, or, at least, a skilled sanitary inspector, needed in supervising the building of all drains. The importance of sanitary plumbing need not be discussed here, but the importance of supervision must be emphasized, for the double reason of insuring good work to the builder and the public, and protecting the honest and really skillful plumber from unjust and unworkmanlike competition.

The number of children of a schoolable age is thirteen thousand seven hundred and seventy (census 1884), nearly all of whom are accommodated in our schools; and some of the larger schools are capable of seating nearly one thousand pupils.

In addition to the above, the inspection included the West Jersey Orphanage (18 inmates), and the Children's Home (25 inmates), and the result was favorable in each case, excepting a large drain, in the yard of the Home, emptying into the playground of the children, contiguous to the building, all the refuse and waste-water of the building. It was at once agreed to remedy this defect, by extending the drain into a cesspool farther from the building.

E—Slaughter-Houses and Diseases of Animals.—An ordinance relating to the slaughtering of animals was enacted by the city council June 3d, 1850, which prohibited the killing of cattle, sheep, swine and other animals within city limits; prohibiting, also, the depositing of entrails within city limits, punishable by fine, imprisonment, or both. The section of this ordinance relating to killing of animals is a dead-letter. I have visited and inspected eight large slaughter-houses, where killing, &c., is done without intermission, winter and summer, and in this city there are about twelve to fifteen

more where butchering is done in winter only. Of the eight inspected, five were found well under-sewered, two under-drained imperfectly, and one surface-drained into a large cesspool, which, however, is frequently cleansed. All of them were supplied with city water, excepting two; one in suburbs with pump-water, and one in city with driven-well. As to the method of the disposal of animal remains, the hides, fat, bones, &c., is sold to the tallow renderers, and the offal carted daily to the country customers, for use as hog feed or mixed in compost heaps. The summer butchering includes cattle, sheep and hogs (and in one establishment, I am loath to include, sick cows and bob-veal). An abattoir is a great city need.

The diseases of animals is a subject which receives the studious attention of the local State veterinary inspector.

Dead animals are usually carted outside of city limits and buried, or sold to the bone-boilers. The small animals are, however, the most troublesome, and dogs and cats, or chickens are frequently found upon vacant lots or alleyways, and require burial under the direction of our sanitary committee.

F—Cemeteries.—There are but two burial grounds used within city limits, *i. e.* Camden cemetery, in the Seventh ward, at a safe distance from the built-up portions of the city, and Evergreen cemetery, in the eastern section of the Eighth ward, and well isolated. There are other and smaller burial grounds connected with a few churches in the city, but are not now used for new burials, and a finely-kept ground adjoining the Camden cemetery, known as the Friends' burial ground.

Both cemeteries are well taken care of by the keepers; the graves are six to seven feet deep, excepting in the section where the city poor are buried, where a depth of four to five feet is considered sufficient. Graves are sometimes re-opened for new burials in them, but as a rule the graves are never disturbed where the occupants have died of a contagious or infectious disease.

G—Refuse and Garbage.—The disposal of house refuse is not governed by any specific ordinance, for the subject-matter is mentioned only in the general sanitary or Board of Health ordinance, wherein the refuse and garbage is prohibited by fine from being deposited on vacant lots, streets and alleyways.

It is customary, annually, for the street committee of city council to contract to the lowest bidder, the work of collecting the ashes, refuse and garbage. The contract price this year, is $2,887.50 The contract stipulations are very stringent, and require the ashes and garbage to be collected separately, and as often as twice weekly, from about September 15th to June 30th, and three times weekly during the summer season. The stipulation in regard to separate collection, is disregarded, although the contractor states his willingness to collect separately if the people will present the material in that shape, he collects as he finds them, *mixed* in the ash boxes near the curb of residences, and dumps the collection, as stipulated again by contract, either along the river front for filling up to grade, or, as now ordered, on a lot of ground owned by the city, that is bounded by Cooper's creek, Market street and the Pennsylvania railroad, within city limits, and near occupied streets. This ground is about four to five acres in extent, and is entirely under water at high-tide, and will be more fully described under Schedule I (Federal street culvert).

The slop-gatherers are a numerous class of small farmers and pig raisers in the suburbs, who, with nearly every description of vehicle from the barrow to the close box wagon, almost daily are seen on our streets collecting slops. These scavengers are not governed by any enacted rules or laws, and probably not sufficiently under control of the contractor to do their work properly, and, as a matter of course, the rejected slops are carted off in the ashes as described, but much of it finds its way to the hog-pens. Here our ordinances are again defective, and nothing short of a specific enactment can so regulate this work as to make it effective, and save our undergrade lots from a filling-up with garbage mixed with ashes.

Then, again, there are certain portions of the city never visited by the gathering carts, *i. e.*, portions of the Seventh ward, and a greater part of the Eighth ward, where the unpaved streets and undergrade lots are the recipients of ashes, and, in not a few cases, of garbage. In these portions of the city, it becomes a question of the greatest importance, "How to dispose of the refuse and garbage?" The drainage is all surface, and too frequently the undergrade lots and streets are converted into shallow cesspools by this debris.

H—WATER-SUPPLY.—The water-supply of Camden is taken directly from the river Delaware at a point about one mile north of

Cooper's creek. The river opposite the water-works is divided into two channels by Treaty island, the smaller channel being on the New Jersey side. This channel is the one from which the supply is taken, and, geographically considered, is superior to any other within a radius of ten or twelve miles. A bend in the river and the favorable location of the island favors the maintenance of the real channel on the western or Pennsylvania side of the river, which, by its accommodating the greater body of tide-water, carries with it also the heavy sewage matter received from both Philadelphia and Camden.

The maximum depth of the Jersey channel is thirty-five feet; width, half mile; length, one and one-third miles; and the only culverts that may be said to empty into the course of this channel, are the two short culverts, State street and North Second street systems, and the North Front street culvert, and Federal street *via* Cooper's creek, as the main culvert terminations. The dilution which this comparatively small amount of sewage receives may be sufficient to relieve any apprehension of danger from this source. But as the channel is a part of the river proper, the river water must receive our special investigation.

The Delaware river receives its water from such a large and diversified water-shed, that its chemical analysis is of comparatively little importance, for the very reason that it has no specific mineral or inorganic taint. The analysis of *Cooper's creek* water shows it to have some of the magnesia-limestone qualities of Schuylkill water; and as a tributary of our water-channel, the analysis by "Reuben Haines, 1884," is here given:

Lime	0.55
Magnesia	0.49
Ac. Sulph	0.64
Total Solids	3.75
Total Hardness	2.60 (Eng. Deg.) in 100,000

And the usual amount of chlorides and nitrates natural to flowing streams.

The same conclusions as to a microscopic analysis, however, cannot apply; for the very reason that the Delaware river between Camden and Philadelphia is made the common receptacle of the sewage of one million people, and the debris of many hundreds of manufactories.

During the past winter our water was unusually cloudy and dirty, and in the cleansing of the basin this spring a removal of over four

thousand cubic feet of sediment was effected by washing the bottom of the basin or reservoir. It was prior to this cleansing that the following results of microscopic analysis of our water were obtained.

The water was received directly from a hydrant, and the settlings and filterings under the microscope was found to consist mainly of ferns, micrococci, amoeba, and the many varieties of rotifera, with others not specially noted. The vegetable algæ and rhizopods were also abundant; all of which were shown to be of normal cell-color and activity. In addition to the living forms enumerated, there were found fragmentary parts of the eutomostacæ and flocculent deposits, no doubt the remains of animalcular and vegetable debris, and sand in a state of fine subdivision.

The question naturally arises, what becomes of the immense quantity of sewage and filth that is constantly thrown into the river? The natural processes of conversion, and especially oxidation, in so large a body of constantly-moving water, may, under favorable circumstances, be sufficient to render the pollution innocuous; but there are times when these processes are more or less suspended, as for instance in midwinter, when the air and sunlight are excluded by a coating of ice, or, perchance, by filth deposited too close to the receiving end of our water-pipe. Which dangers, however, are preventable by the stringent application of a better legislation than Camden has had heretofore in regard to the protection of this channel.

The water-works are well situated, and are defective only in the position of the receiving end of the water-pipe, which is almost flush with the end of the wharf, and visible at low tides.

The works are provided with two pumping-engines, one with a capacity of 5,000,000 gallons daily, and a reserve engine of 2,500,000 gallons capacity. The reservoir is of a size sufficient to contain 4,500,000 gallons. The average daily consumption of water for the year 1883 was 3,100,000.

The water-pipes leading into the city are well distributed and reach every part except portions of the Seventh ward and a greater part of the Eighth ward.

The number of dwellings and stores supplied is	7,594
Manufactories	35
Railroad depots	4
Total buildings	7,633

And it is estimated that out of a population of 45,000, 38,000 constantly use the city water, and of the remainder a large majority as constantly use well or pump-water. The number of houses not supplied with reservoir-water is about 1,300.

Before the present water-supply system was introduced, it was the custom of the then city authorities to assist the residents in building pump-wells near the curb-line of public streets, which resulted in the planting of such wells in almost every part of the city. A great many of these wells have been filled up since the introduction of the Delaware water, but there remain a full half hundred still in constant use, and two-thirds of this number are in the upper four wards. Many of these wells should be discontinued on account of their proximity to culvert inlets. In some cases they are located on unpaved or otherwise badly-drained streets.

The parts of the Seventh and Eighth wards that are the least well drained are where the pump-well system of water-supply is mostly employed, but as the reservoir water-pipes are being gradually extended into these wards, a few facts only will be cited:

The Seventh ward east of the Camden and Atlantic Railroad is not supplied with city water, and it is the custom of the residents to plant a cucumber pump in a dug well varying in depth from twelve to twenty-five feet, in some convenient place in the yard, without a sufficient regard to the close proximity of a privy-well or surface-pool of stagnant water. In one case we found an interval of only six feet between the pump and privy-well, and many others varied the intervening distances from six feet to about fifty feet, and the users of these wells are frequently driven, after heavy rains, to borrow water from a neighbor's pump, on account of the foul odor and taste of water in their own wells. The population of this district is about six hundred.

Sycamore street, on the west of the railroad, is the only one long street not supplied with city water, but the residents here have access to hydrants on neighboring streets, only a few being obliged to use pump-water; these few pumps are no improvement over those found east of the railroad. Hog alley is a small and horribly dirty street, contiguous to Sycamore street, above Seventh, and was the starting point of the small-pox epidemic here in 1881. The streets of this district are neither paved nor graded.

The pump-well district of the Eighth ward is but a repetition of the Seventh ward, with the exception of a few localities where the

driven well has been introduced, which is far superior to the open well, from the fact that an upper strata of clay of variable thickness is pierced by the pipe before the water-vein is considered tapped. It would prove too lengthy an account to attempt a detailed description of the one hundred and fifty wells in this ward; suffice it to say, "that a depth of from twelve to forty feet, with a siding of brick or board, fairly describes one of these wells;" and a taste of water from most of them is nauseous and unwholesome to any one not accustomed to it. A few of the wells along the line ditch are very shallow, in fact, supply surface-water only. "A cucumber pump stuck in a hole in the ground," fairly describes the situation. There are a few of the old-time pumps in this district which supply a fairly good water, one of them, however, on Miller street, below Central avenue, is planted in low grade, and, after a prolonged rain, is filled by surface-water flowing into the top of the well, standing, as it then does, in a pool of water. There are about four thousand people who use pump-water in this, the pump-well district, of the Eighth ward; the city water pipes only supplying Broadway and a few contiguous streets.

In summing up briefly, it is well to note the existence of certain factors in our water-supply which, in the event of specific contagium, might render the best sanitary precautions abortive. And nothing short of a properly organized Board of Health and efficient inspectors can be relied upon for a safeguard against any threatening or existing zymotic diseases.

I—Drainage and Sewage.—The topography of Camden is favorable in the main to good drainage, when proper means are employed to effect it. The most favorable inclines for drainage are from the water-shed line, as represented in accompanying chart and marked thus × × × ×; in which directions nearly all of the street culverts are laid, with the exception of a few north and south street culverts. The water-shed line has a mean altitude of eighteen feet above tide-water, the inclines running toward the river, Cooper's creek, and line ditch; the outlet of the Tenth street culvert, as represented on the chart, however, is two and a-half feet above tide-water. The streets running north and south have favorable inclines for short distances only, and, therefore, cannot be utilized except for draining into east and west street culverts.

For convenience of description the culverts will be divided into

ten systems, and, for the sake of brevity, the principal defects alone will be described.

1st. The North Second street culvert has a length of 1,364 feet, and is defective only in having its four inlets situated at the intersections of unpaved streets.

2d. The North Front street sewer is 6,580 feet in length, and through its six-foot outlet it sewers the built-up portions of the city north of the Camden and Atlantic Railroad, and most of the water-shed line, excepting only that portion drained by the Second street culvert. Through the man-holes, near the distal ends of this culvert, where the streets were not paved, large quantities of sand were found to nearly fill the sewer's caliber, carried there through the inlets from the unpaved streets, suggesting at once the impropriety of culverting unpaved streets. In other respects this culvert is efficient, and drains a fair percentage of houses along its course.

3d. The large Cooper street culvert drains all the territory north of that street to the railroad, and east to a little beyond the water-shed line, as per chart. This sewer is the largest and best in the city, and has a length of 21,653 feet. The portion that extends north (on Front and Second streets) of this sewer is, however, too nearly on a dead level to prevent the solid debris from accumulation on the sewer bottoms, and one place particularly, at Second and Elm streets, the culvert has the appearance of gradually filling up. The only remedy in preventing the closing up of this important culvert is an extension of the Pearl street sewer into the river, which, as per chart, is now shown to extend to within one-half square of it. The rapid and valuable improvements being made in this part of the city, strongly call for this improvement. This sewer is the means of underdraining more buildings than any other in the city. One other defect may be mentioned in this system, *i. e.*, the great depth of the slip into which this culvert opens; a reference to the chart will show the extension of wharves on both sides of this slip, and at low tide about one-third of this slip-bottom is exposed to the air, which is more or less covered with sewer filth about two hours each day, in fact, until the rising of the tide. The fecal odors at low tide are very perceptible.

4th. The Arch-Federal street sewer is a most excellent one, excepting the one error of discharging the Federal street end into a large cesspool of a square's length before reaching the tide-water of Cooper's

creek. The extent of this system is 14,653 feet, and about 4,000 feet of this length is drained east on Federal street into a ditch alongside of the street, and along the border of a four-acre lot of ground owned by the city, and bounded by Pennsylvania Railroad on the north, Cooper's creek east and Federal street south. This ground is marshy and covered with water every tide, and although this ditch of a square's length is supposed to have a sufficient grade to carry off this sewer debris, it is nothing but a cesspool at its best. Each tide on rising distributes the ditch contents all over this marsh and converts it into a reeking and pestilential pest-hole. Fortunately there are but few buildings in the immediate neighborhood, but the adjoining street is a main thoroughfare and largely traveled, and the best interests of our citizens demand a correction of this, the worst sanitary defect in the city of Camden. The city owns this marsh, and it is being gradually filled up to grade with the ash collectors' debris, beginning at a point farthest from the creek and protecting the encroached-upon trench or ditch with upright planking. The sanitary condition of this neighborhood is also seriously compromised by an open gutter extending along the north side of the Amboy Railroad, and receiving in its course the surface-drainage, including sewage from the premises of about sixty houses, located near the railroad tracks. This condition is especially noticeable in the rear of California row; this row, of about a dozen houses, is the worst of the lot, and could readily be improved by draining into Federal street culvert; all alike, however, should be restricted in the custom of using this gutter for the purposes of a sewer. In all other respects the Arch-Federal street culvert system is in good condition.

5th. The Benson street system of 19,035 feet of culverting was found in excellent condition, excepting that part located on Mickle street, and from thence on Second street to the Benson street main. On account of complaints received from residents on these streets, the city surveyor and myself endeavored to make a close investigation, which resulted in locating the cause of the complaint in the culvert bend at Second and Mickle streets. The sewer was opened, and within a culvert length of thirty feet, no less than five water and gas-pipes were found to pass through the caliber of the sewer and seriously obstruct it. In fact, the sewer was nearly full of sewage and dirt, the location of these water and gas-pipes favoring the lodging of the debris at this point, sufficient, after a heavy rain, to totally obstruct

it, as was verified during the past spring, while the obstructed water was forced through the inlets and low manholes in the street above obstruction. I have examined cellars along Mickle street that bore twenty-inch water marks, and was informed that the heavier rains usually filled the cellars to that depth with water, some of it, no doubt, due to the obstructed culvert, but in part due, also, to the character of the gravel, which is made ground, and at Second and Mickle streets only two and a-half feet above high tide-water. The tide-water enters, or at least obstructs, the culvert flow, so that it is normally filled, at high tide, up Mickle street to Third. It is very evident that gas and water-pipe obstructions, under such circumstances, must prove a most serious defect. And in this instance the culvert obstruction was promptly removed. Other instances, however, of culvert obstructions of a like character have come under my notice, as, for instance, a water-pipe of six-inch dimension running through Second street sewer, between Mickle and Stephens, one of same dimensions at Third and Mickle streets, and a large gas main through a culvert near the gas works. It is very evident that our municipal laws are very defective in thus allowing willful obstructions to be placed in the culverts, and we need an ordinance, specific in its terms, relating to the laying of all gas, water and drain pipes and the building of culverts; giving the culvert the right of way in a question of grade at all times, and never allowing the tapping of a sewer or culvert, excepting by special permit.

6th. The Clinton street culvert of 14,390 feet length and five feet outlet, is in excellent working condition. It is proposed to divert 5,000 feet of the Benson culvert system to the Clinton, on account of the more favorable location of the Clinton sewer for draining this district east of Fifth street. This is a wise and practical proceeding, and is now being effected by changing the Washington street culvert grade, in order to connect at Fifth and Washington the Clinton and other street culverts east of Fifth street, in this locality. This sewer is also now being extended 400 feet towards the river wharf lines, which is a distance of about 1,000 feet from the shore, with an intervening marsh.

7th. Division street culvert system has a length of 11,775 feet. About ninety per cent. of this length is laid on east and west streets, and therefore of good grades. There is a few inches of sand found in culvert bottom, owing to some of the streets being unpaved. There

are comparatively fewer houses and privy-wells underdrained in this district than any other of the described systems.

8th. The Walnut street system is also a good east and west grade sewer, and has a length of 7,220 feet. This culvert is extended well towards the exterior wharf line, and in this respect is far superior to the Division street sewer. There are also more houses underdrained in this district, but the sewer is found in equally as good a condition.

9th. The Kaighn avenue system has a length of 6,085 feet, and is in excellent condition, excepting that part west of Second street, which is run too nearly on a dead level to be kept clear of settlings. A deposit here of about ten inches was found in a sewer caliber of four feet.

10th. The Tenth street culvert, as traced on the accompanying chart, is a large underdrain for the streets of that section of the Seventh ward. There is but one building that drains into it, *i. e.*, the Liberty school. None of the streets under which it is laid are paved, the man-holes are deeply covered with dirt, and many of the inlets are too high above the gutters to catch even the rain-fall. And well it is that this culvert is not a sewage drain, for the reason that its outlet is into an open ditch at Tenth and Kaighn avenue, which traverses line ditch for a mile before reaching the river tide-water. The altitude of this point is three and a-half feet above tide-water, and separated from it by two flood gates located between the sewer outlet and the river. The culvert ground east of the railroad is about twelve feet under grade and about one and a-half squares in extent; the undergrade ground is owned by private parties, for whose benefit the culvert was built with an open end, to favor the drainage of this section, but the ground is too low grade. As a result two large ponds of water are constantly present, and by their receiving all the surface drainage of the neighborhood are really converted into large cesspools, similar in some respects to the cesspool outlet of the same sewer. This culvert system includes a length of 11,092 feet, of two, three and four feet culverting, and is really under the circumstances a useless waste of material.

There are in this city three other short culvert systems: One at State street bridge of 1,290 feet; Ferry road and Jackson street, 4,415 feet, and a sewer on Jefferson street of 1,923 feet length. These sewers are in fair condition, excepting the Jackson street branch, which carries more sand than an effective sewer should, no doubt owing to the storm-water washings of the unpaved streets.

There is a total length of 128,492 feet of culverts traversing the streets, which is under the supervision of the city surveyor, so far as relates to the mechanical construction of them. In case of obstruction or inlet choking, the street supervisor is the one to apply the remedy, under the direction of the street committee of city council.

The sewer defects as recorded, are well known to our city officials, and the reason given for their non-correction is "short culvert appropriations." The city is building faster than the culverts can be laid and repaired, under the present so-called short appropriations, which, in true economical sense, should not be the case. And one of the most reprehensible defects in our system of culverts is the presence of water and gas-pipes in them, running through the sewer calibers as though obstruction were of no consequence. This is an error that a short appropriations plea will not defend, and an ordinance defining the grade lines of all pipes and culverts, giving the right of way to the sewage and drain pipes or culverts, is a necessary and essential legislative act in remedying this easily-corrected defect. On general principles an obstructed sewer or drain-pipe is worse than none at all.

In regard to house and lot drainage, we find there is no supervision provided therefor, excepting only when complaint is made to our local sanitary committee or its inspectors. The drainage of new or old buildings is entirely depending for efficiency on the owner or his plumber, and is too frequently a matter of dollars and cents. Drain-pipes are frequently laid by common laborers who do not profess to know what a drain-trap means, and I have become acquainted with a number of cases where house and privy-well drains have been laid without any trapping at all.

The necessity for a close and constant supervision of all work of this kind is so obvious that the Legislature has provided therefor in a special law applying to all cities that have Boards of Health formed under the State law, which this city has not.

The number of cases where houses and lots are badly drained is so numerous that an attempt at details will not be made, excepting two instances of lot drainage. First, of a lot bounded by Second, Washington, Third and Berkley streets, is two to three feet under grade, only excepting the street fronts. This lot is built upon on its four sides, and is travesed by very narrow alleyways (three feet); and a large percentum of the residents are in the habit of dumping their kitchen refuse in these alleyways and in the rear of their lots,

converting the middle of the square into a huge compost heap, sour, rank and very unwholesome. The sanitary committee have long endeavored to suppress this nuisance, but without success; and the reason given by one of the committee is characteristic, "No funds to proceed in the matter." (Refer to Schedule J.) Another undrained lot, at Second and Mechanic, is in a similar condition, and the sanitary committee here have wisely ordered a sewer drain, to correct this evil and run the stagnant and filthy water through it into the Kaighn avenue culvert. There are numerous lots in this section whose owners should be compelled to fill up to grade, or connect with the culvert drain.

One other important matter under this heading, is the undrained privy-wells in all parts of the city. I cannot give in full detail the number and location of such wells, and therefore will give only the system of cleansing employed. Privy-wells are as a rule declared nuisances by our sanitary committee when complained of and found overflowing or filled to within six inches of top, and are abated as such, either by owner on order, or by city at owner's expense. The ordinance rules restrict the cleaning of wells before 11 P. M. by the open method, but allows the odorless excavating apparatus to work at any time during working hours. The privy refuse is all taken beyond the city limits, and much of it used in compost heaps and manures in various ways by farmers and truckers.

J—PUBLIC HEALTH LAWS AND EXPENSES.—The Board of Health of the city of Camden is governed by an ordinance, passed May 7th, 1872, with supplements, March 27th, 1879, and an additional ordinance on the relations of the Inspector to Board, mainly as to his clerical duties, and of no special importance.

BOARD OF HEALTH ORDINANCE.

Enacted May 7th, 1872.

[This ordinance is too lengthy to copy verbatim, since much of it has become a dead-letter, and it will, therefore, be presented in sections in as concise form as possible, and mainly for the purpose of showing its defects.]

Section 1 ordains that five members of city council shall annually be appointed by the president of city council to constitute a Board of Health.

Section 2 provides that a vacancy be filled by city council.

Section 3 ordains that the Board shall meet at such times and places as they may deem proper, and they shall keep a journal of proceedings. They shall have power and it shall be their duty—

(1). To inquire into and inspect all nuisances prejudicial to health, and abate the same in any way deemed expedient.

(2). To detain and examine any persons suspected of carrying any pestilential or infectious disease from an infected place.

(3, 4, 6). Provide for the removal of travelers or residents to hospital, when removal is necessary for the preservation of the public health.

(5). Remove or destroy all furniture that may be tainted with pestilential disease.

(7). Clean, abate or remove all nauseous, offensive or unwholesome matters detrimental to health.

(8). Persons disregarding rule 7, after due notification by the Board, are liable to a fine of fifty dollars.

Sections 4 and 5 ordain that any person who shall deposit filth of any description upon the streets, lots, etc., of the city, shall be liable to a fine of ten dollars.

Sections 6 and 7 provide for the abatal of nuisances by the city authorities at the expense of owner or occupant of such premises, when necessary, and a fine of ten dollars against any owner allowing his premises to remain a nuisance.

Section 8, the cost of abatal of nuisances by city to be collected by the city solicitor.

Sections 9, 10, 11, repealed by the ordinance supplements enacted March 27th, 1879, (to which refer in this report.)

Section 12, employment of nurses in the hospital.

Sections 13 and 14 ordain that decomposed or offensive materials shall not be landed by any ship or vessel until a permit is granted by the Board of Health, under a penalty of one hundred dollars fine. Also gives power to Board, in quarantining all vessels or people on board, in cases of suspected infection of pestilential diseases, &c.

Section 15, a suspected infectious dead body cannot be brought into city without a Board of Health permit.

Section 16, all infectious or pestilential diseases in city must be reported to Board, under penalty of ten dollars.

Sections 17 and 18 fine any person practicing inoculation of small-pox, and also person inoculated, &c.

Sections 19 and 20 relate to the necessary isolation measures to be taken by the Board in infectious diseases, and fine all persons who refuse or neglect to comply with the Board of Health's precautions.

Section 21, precautions to be taken in all contagious or infectious diseases.

Sections 22 and 23 define the duties of physicians or coroners in granting death certificates.

Section 24 not in force.

Section 25 prohibits removal of buried bodies between May 1st to October 1st, without a Board of Health permit; penalty, twenty-five dollars.

Section 26 ordains that all persons practicing midwifery, or, in case of non-attendance of such, the parents, shall report each birth return in full (monthly), or be fined five dollars for each offense.

Sections 27 and 28 prohibit any bone-boiling establishment, compost manufactory or depository of dead animals within city limits, and pronounce it unlawful for any person or persons to possess deposit places for poudrette or privy filth within city limits; penalty, one hundred dollars to two hundred and fifty dollars fine.

Section 29 fines any person for depositing sink or privy filth in any public place.

Section 30 a dead-letter section.

Section 31, any or all persons obstructing the work of the Board of Health shall be fined fifty dollars.

Section 32 provides for the recovery of all fines under this ordinance in an action for debt, &c., or an imprisonment for a term not exceeding ten days.

[Total length, thirty-two sections.]

An important supplement to the above ordinance, enacted March 27th, 1879, after defining the duties of magistrates in imposing, collecting and transfering fines to city treasurer, &c., provides in its

Section II. That the supervisor of highways shall act as inspector of the Board of Health, and his duty shall be to inspect all nuisances for report to the Board, and examine and report, within twenty-four hours, upon all complaints made to the Board, and shall serve all notices of the Board upon offending parties, and shall, at the expiration of such notices of abatal of nuisances, re-examine premises and make a second report to the Board for further action. He shall also examine all cesspools or privy-wells complained of, and, in case the

city is obliged to abate such nuisances, shall take measurements of the same for use of the Board. And he shall see that all special orders of the Board relating to street cleaning and garbage collecting are complied with, and shall receive for compensation one hundred and fifty dollars annually, to be paid out of sanitary committee appropriations.

An ordinance enacted June 12th, 1884, ordains that the inspector shall also be the clerk of the Board of Health.

According to these ordinances and supplements our Board of Health is not constituted in accord with the intent of our present State laws. The members, as appointed from city council, may be out of their element entirely as sanitarians, and the annual re-organization of the Board is but another factor of disability. The appointed members, as merchants, mechanics or manufacturers, may not be in a position to refuse an appointment upon such a Board of Health, and yet, as members of city council, they do accept such a position with good-natured acquiescence, let the result be what it may. The present Board of Health is frequently called by the chairman, Mr. Bourquin, before he obtains a quorum, and when it does meet it is, probably, for the sole purpose of indorsing the actions of its worthy chairman, who has ever taken great interest in sanitary affairs, but who is not efficiently well assisted by the entire Board, or backed by the necessary legislation to make his work effective and satisfactory.

The inspector of the present Board is street supervisor (salary, $1,000 per annum), health inspector and clerk of the Board (salary, $150 per annum), and can't be expected to be more than he is, *i. e.*, street supervisor.

The inspector's report gives the number of nuisances ordered abated as forty-eight, from June 1st to September 1st, 1884. Of this number thirty were privy-well overflows and the balance defective surface-drainage. About thirty-five nuisances were abated by owners, as ordered, and a few abated at city's expense, with about eight or nine remaining unabated.

The annual appropriations for this, the Board of Health work, is $2,000, out of which $1,600 is paid the Camden Dispensary (for medicine and medical attendance to the poor), $150 is paid to the inspector as a yearly salary, leaving a balance of $250 for the work of the sanitary committee, or Board of Health, for a whole year. This, as

might be expected, is soon exhausted, and, as a result, the contemplated sanitary work is suspended. Much of the sanitary work of the city is left undone for this very reason, and under such circumstances the Board shares the responsibility of ineffective sanitary work with the city council and its present defective and dead-letter ordinances.

There are a few sections of the Board of Health ordinance that are really worthy of adoption in a modified form, but so much of the ordinance has become obsolete that all of it may be said to have outlived its usefulness.

Camden, with its 45,000 inhabitants, may be said to have no Board of Health, as Boards are now constituted under the present State laws. Nor can it be said that there are any definite sanitary provisions or enactments that are worthy of being called health laws. A re-organization of our entire sânitary legislation is urgently needed, and if this warning be disregarded let the responsibility be placed where it belongs.

K—Vital Statistics.—Camden has been remarkably free from epidemic diseases for the past year, excepting the mild prevalence of measles, pertussis, and some scarlatina.

In examining the statistic records as kept by the city clerk, I find therein a record of reports as received, without any attempt at tabulation, and defective in the matter of birth returns.

On August 26th, the following reports were tabulated from the record books, for June, July and August:

June, 1884—	
Births	60
Deaths	87
Zymotic disease deaths	20
July, 1884—	
Births	50
Deaths	103
Zymotic disease deaths	19
August, 1884, (prior to 26th)—	
Births	5
Deaths	79
Zymotic disease deaths	10

The birth returns received in each month for registration, differ very materially from the records as quoted. Thus, in June were received seventy-three returns; July, forty-six, and August, eighty-

seven. This disparity is owing, no doubt, to the custom of physicians in sending in their reports when convenient; with some it may be once a month, others, three months, etc. And I have good reason for believing that a few are guilty of never reporting a birth.

An effort was made in June last to enlist the services of physicians and others in their making more prompt returns, by the mailing to each of a copy of the State law and a circular, which had the effect of slightly swelling the list of returns, but not by any means of making them satisfactory or complete.

Excepting the birth returns, the statistic returns are complete, and are made according to the legal statutes.

The death-rate of Camden for the three months mentioned is one in every one hundred and sixty-seven population; and the number of zymotic disease deaths as given is merely to be taken as an estimated factor, for the very reason that the death certificates in many cases merely give the immediate cause of death, thus rendering the task of learning the zymotic influences in the causation of deaths a most difficult one.

According to the given estimates, the proportion of zymotic deaths to others is as one to four in June, one to five in July, and one to seven in August. The great prevalence of zymotic diseases in Camden, with its excellent natural conditions attending a residence here, is no doubt due to defective sanitary administration.

As to the location of these reported deaths from zymotic diseases, thirty-one out of the forty-nine occurred in the four lower wards, and a large proportion occurred in that portion of the Fifth ward bordering Line ditch. This ground is much of it under grade, and numerous stagnant pools of water are found, without a possible chance of draining. And the present local Board of Health have with commendable spirit declared the necessity of abating this nuisance by the building of a culvert from this point, Second and Mechanic streets, north into the Kaighn avenue culvert.

Before closing this report, I desire to say that there is much to condemn in the sanitary condition and management of the city. I feel that this report, as the result of a prolonged inspection, loudly calls for the relief embodied in the late enactments of our State laws in regard to local Boards of Health; not only do we need the protection of such a Board, but one that is largely composed of practical sanitarians and able inspectors, organized according to the spirit and letter of approved sanitary science and administrative art.

ATLANTIC COUNTY.

HAMILTON TOWNSHIP. - *Report from* D. B. INGERSOLL, M.D.

Since July we have had a number of cases of typhoid malarial fever. I coin the name to correspond to the general symptoms of the disease. And these cases, fifteen in all, have all, with one exception, been confined to those families who have used water which analysis had shown to be remarkably pure. I may say, however, that a number of other families have used this water exclusively, and yet have escaped the sickness. The stream has been unusually low this fall, and consequently much decayed vegetable, and perhaps animal, matter have impregnated the water. These cases of fever, though generally severe, some of them were almost or quite typical cases of typhoid, were fatal only in two cases, and these the result of influences outside of the fever proper. The drainage usually gives us dry cellars. There are generally no malarial influences, except in very dry seasons.

We would respectfully suggest that the State Board recommend legislation in regard to the tenement houses, forbidding the renting or even the occupancy of them unless there be a sufficient water-supply of good water near the house. In some of our tenement houses they are compelled to drink river, or in very many cases, surface-water from wells, or to carry the water some distance from the wells of their neighbors.

And again, in regard to ventilation, many of the houses are "thrown together," and thus made "good enough to rent," and no possible means of ventilation except by doors or hoisted windows. If the windows in all cases were made to lower from the top we think the health of the inmates would be improved.

The law in regard to minors under a certain age buying tobacco has had a good effect in this township. Yet it is so lame that, as soon as its imperfections are known, it loses its force. As it now is, the parent must prosecute. Make it that any person may prosecute for selling to those under a certain age, and we may protect our youth from its baleful influences.

ATLANTIC CITY. *Report from* EDWARD A. REILEY, M.D., *Sec'y.*

Occupying a portion of the sandy island of Absecon, Atlantic City is underlaid to an unknown depth by the most recent of the tertiary

formations. Clear quartz sand mixed with the debris of modern marine shells, and laid in place by the combined action of winds and waves, is the material of the soil.

This condition has been so modified by the occupancy of about 8,000 people that the winds are no longer geological forces, and the ever-shifting sands of an uninhabited beach are here covered and held in place by houses, graveled streets, and pavements, the general level of the land being constantly raised and producing a totally different set of conditions, as viewed from the standpoint of the sanitarian.

The rainfall, which formerly passed rapidly into the sand, now no longer able to find its way through the closely-packed gravel of the streets, becomes a subject for close attention from the local Board of Health.

Happily in Atlantic City the contour of the ground is such that there is sufficient fall for an admirable system of surface-drainage at small cost, and although in some of the newer streets this system has not been fully completed, yet, taking the city as a whole, the disposal of surface-water is prompt and efficient. In the main avenues flagstone gutters are the rule, and the tendency is toward their universal adoption.

The raising of the streets and avenues to a fixed grade has made it necessary to fill private property to the same level. This important matter is in the main well attended to by property owners, although there are still a sufficient number of low lots on which rain-water stands until it slowly soaks away, to require the constant efforts of the Board of Health in remedying the evil.

Underground sewerage has not as yet been attempted, but such strenuous efforts are now being made in that direction that probably before the expiration of another year such a system will be in operation.

Meanwhile the prompt removal of refuse and excreta, as well as the dish-water and wash-water of the larger hotels, is rigidly enforced by the Board of Health.

The water-supply of Atlantic City comes partially from the mainland, nine miles distant, and as it is pumped from a pure stream draining a sparsely-inhabited area, the quality of the water is excellent.

The small amount of mineral matter contained in it necessitates the use of other material than lead for pipes, as that metal is readily dissolved in quantities dangerous to health.

Cisterns form another and excellent source of water-supply. Extra

attention is paid to their construction and cleanliness by property owners, and a section of the Sanitary Code, which is enforced, provides that no pigeons shall be allowed at large.

All markets and slaughter-houses are under the strict supervision of the Board, through their sanitary inspector, and the provisions of the code in regard to water-tight floors and general cleanliness are fully complied with.

No trades or manufactories offensive or prejudicial to the public health have as yet gained a foothold in Atlantic City, and in view of the fact that our city is essentially a health resort, public sentiment is strongly in favor of excluding such establishments from the corporation limits.

Swine, goats and geese are not allowed within the city during six months of the year, and there are no interments of human remains on the island.

The cases of contagious diseases during the year have been few. Under the instructions of the Board, the sanitary inspector, with the co-operation of the physicians in attendance, systematically quarantines every case of scarlet fever, and, after the convalescence of the patient, thoroughly disinfects the premises.

By an arrangement with the Board of School Trustees, children from any family having the disease are excluded from the schools until they are re-admitted on the certificate of the sanitary inspector, who is a medical man.

During the past year the general health of the city has been good, and during the summer months, when our population increases sevenfold, the freedom from disease has this year been remarkable.

The peculiar climatological and geological surroundings of Atlantic City doubtless have a larger share in contributing to this immunity from disease than the strictness of sanitary regulations, although we believe our Sanitary Code to be a good one, and it is in the main well executed.

BERGEN COUNTY.

MIDLAND TOWNSHIP. - - - - ——— ———.

No sewerage; a few cellars drained. Houses generally have cellars; generally used for storage of vegetables. Cesspools open bottom and sides.

PALISADE TOWNSHIP. - *Report from* D. H. VOORHIS, *Sec'y.*

The past year has been a very healthy one. There has been no epidemic of any kind whatever. Malarial fevers, which have been more or less prevalent of late years, have been less so than usual during the past year.

There has only been one complaint made to the Board of Health of this township during the year, and that was in reference to the drainage of a vacant lot. This was adjusted by the parties owning the property deepening and widening a few ditches.

There have been no cases of contagious diseases among live stock reported to this Board.

All topics in your schedule have been answered in previous reports of the Board of Health.

SADDLE RIVER TOWNSHIP. - *Report from* J. E. KIPP.

There have been no contagious diseases of animals reported to us during the past year. The assessor inquires if any losses of animals and of contagious diseases among cattle.

Malarial fever still exists. There can be no doubt that the malarial diseases prevalent in some parts of the township are largely, if not exclusively, due to the low, imperfectly-drained meadow land lying by the sides of railroads and by the side of the Saddle river, which is drained by natural drainage.

UNION TOWNSHIP. - *Report from* JACOB G. VAN RIPER, *Sec'y.*

Water-supply is from wells and springs. Water good where it is not contiguous to privies and cesspools. Western slope has soft water. The eastern slope water is hard. The Jersey City water works are in the township, for the supply of Jersey City only.

No public drainage or sewerage.

The refuse excreta is in excavated holes in the ground laid up with dry stones. When filled are emptied and mixed with ground, and sold to farmers and gardeners as a fertilizer. This undoubtedly is the cause of a greater part of what is called malaria.

The prevalent disease has been a very mild form of malaria.

BURLINGTON COUNTY.

FLORENCE TOWNSHIP. - *Report from* CHAS. A. BAKER, M.D., *Sec'y.*

Florence, the largest town in the township, situated on the banks of the Delaware; population about 1,000. A large foundry is located here, owning numerous tenement-houses, which are built in blocks, streets and alleys dividing them. These by-ways have received during the past year strict attention from our local Board, and with the gentlemanly assistance of the manager of the foundry great sanitary reform has been instituted in these places and pestilence undoubtedly stayed. The refuse and excreta from these houses is now carted away biweekly with covered carts provided for the purpose.

NEW HANOVER TOWNSHIP. - *Report from* GEORGE C. DAVIS.

Typhoid fever has been prevalent through the summer months and a part of the fall, in some localities. There is no epidemic among animals, although the hog disease is along the borders of our township.

SPRINGFIELD TOWNSHIP. - *Report from* FRANKLIN S. ZELLEY.

We have no swamps or boggy places. The land is mostly well underdrained, although there are some cases of malaria. I don't suppose there is a house in this township without a cellar, and in those cellars are stored away during the winter months apples, potatoes, turnips and cabbage and other vegetables, and for all that we are generally healthy and no epidemic prevails. The hog disease which is very bad in Pemberton township, although adjacent to us has not got over the line yet, but we fear it will. Several farmers there have lost all or nearly all their crop of hogs.

CAMDEN COUNTY.

CENTRE TOWNSHIP. - *Report from* N. BARTON, *Sec'y.*

In January and February there was an epidemic of scarlet fever in the eastern part of the township, followed, in April, by one of measles, though not so extreme as the first.

There have been more fevers, of malarial origin, this year than last.

DELAWARE TOWNSHIP. *Report from* F. E. WILLIAMS, M.D., *Sec'y.*

The drinking water-supply throughout the township comes from wells and springs. It is good soft water, with very few exceptions. Some wells have been rendered unfit for drinking by being too near barn-yards and have been abandoned.

The usual mode of getting rid of the refuse of the house is by throwing it in some low place near the kitchen door, which custom is a bad one, and is no doubt one of the causes of sickness to the inhabitants.

There have been numerous cases of infectious pneumo-enteritis among the swine in the western part of the township, one farmer losing some three hundred dollars' worth. They were put under the supervision of one of the State Veterinary Surgeons and the spread of the disease was stopped.

CAMDEN CITY. - *Report from* GEORGE VAN BENSCHOTEN.

Our water-supply is from the Delaware river, above the city; the city furnishes water; at times discolored by high floods; reservoir and pipes cleansed about every year.

All sewerage, combined system; drain to river. Two blocks back from river, in southern portion, water in cellars, and swamps below southern part of city. Brick sewers; grade low; main sewers, six feet; secondary sewers, two to three feet. High tide or below, storm and tide flushing. Ventilation by perforated man-holes. Sewerage, twenty-five miles.

Surface drainage. About one-half of cesspools drain into sewers; very few with cemented floors; emptied by carts and odorless companies.

Typhoid prevails.

GLOUCESTER TOWNSHIP. - *Report from* JOS. E. HURFF, M.D.

There is a good natural drainage throughout the whole township. The cellars are generally dry, with the exception of a few located in Spring Mills very near the pond. In these houses I learn that the cellars fill with water during stormy and wet times to the depth of several inches. There are drains running from these cellars, but they are choked up. In these houses chills have been quite prevalent this season. There are no sewers. Throughout the township the farmers

use their cellars for storing away their late crops, such as potatoes, &c., but all seem to be kept in best possible condition.

HADDON TOWNSHIP. - *Report from* J. STOKE COLES, *Sec'y.*

We have had several complaints on account of stagnant pools of water—refuse water from sinks emptying into streets through pipes—and a few hog pens. After notifying the owners thereof our request was generally complied with at once. There was one case in which we had to order the pipes plugged.

There have been several pens of hogs affected by "hog cholera" this fall, and, in most cases, they die suddenly. They have lost several hogs at the Camden County Almshouse farm lately from this cause. As soon as possible after being discovered, those that were able to be removed were driven out into a sand field for pure air, and there was no more of it; showing clearly that the disease thrives best in filth.

STOCKTON TOWNSHIP. - *Report from* DR. P. W. BEALE.

Every death, birth and marriage is reported in the township to Eli Browning, the assessor.

As for quarantine and care over contagious diseases this township should be well versed therein, as there is not a year for the last five, that we have not had cases of small-pox.

There was a single case of small-pox in the township, but through the enforcement of vaccination and quarantine we were able to prevent the further spread. The township has been unusually healthy. Malaria in its various forms has had a marked decrease. Several cases of diphtheria of a malignant type occurred, and a few cases of scarlet fever, but comparing the health of the township to that of previous years there have been comparatively few cases of serious maladies. We have had several cases of nuisance of various kinds, but have had no trouble in removing the same.

Stockton township's population is composed of a large number of colored people, and it is in close proximity to Camden and Philadelphia, and the colored people as a rule visit the slums of Philadelphia, and as the cholera is threatening, I think it proper and just to the inhabitants to exert every possible means to keep the township in a good sanitary condition, and any suggestions or information from the State Board will be thankfully received.

CAPE MAY COUNTY.

CAPE MAY CITY. - *Report from* H. A. KENNEDY, M.D., *Sec'y.*

We have been called upon to abate eleven nuisances, consisting of filthy hog-pens, cesspools and deposits of garbage.

Our water-supply is ample and good, there being no change since last report.

Sewerage system has proven satisfactory, and since last year's improvements has not needed any attention.

Our streets are thoroughly cleaned once a week, and well sprinkled every day during the summer months.

There are a number of cesspools and privy-vaults in parts of the city not accessible to the sewers. Some are cemented, others open bottom, and some merely a hole dug in the ground. These are cleaned at night by scavengers.

There has been no disease among horses or animals during the year. No registry of persons keeping horses, cows or hogs is kept.

We have no slaughter-houses or abattoirs within the city limits, but have a number of hog-pens, which become very offensive during hot summer weather. These the Board hopes to be able to remove during the summer months.

During the past year there has been no epidemic, and, with the exception of a few cases of diphtheria among the colored population during the early summer, it has been exceedingly healthy.

MIDDLE TOWNSHIP. - *Report from* STILLWELL H. TOWNSEND.

The water-supply is mostly from dug wells, although there are quite a number of driven wells, and occasionally a cistern, but not many. The water from the driven wells in most cases is excellent, but in far too many cases the water from dug wells is just calculated to produce diseases.

The past year has been one almost entirely free from any of the prevalent diseases. The Board have kept a strict watch over all cases liable to become a nuisance, but up to this time no nuisances have been reported. The hog cholera that is prevailing in some parts of the State has not reached us so far as I know. The Board will keep strict watch, and should it make a break-out, do all in its power to

prevent its spread. The question of cemeteries is one, I think, that demands attention even in this township, although so thinly housed. Houses are built and being built very closely to some of the cemeteries, and I do not see why the germs of diseases should not be drawn off in the water, and I think some speedy action should be taken in this very important matter.

UPPER TOWNSHIP. - *Report from* R. MARSHALL, M.D., *Sec'y.*

Drainage is complete and prompt, as there is a gradual slope to the river. The usual water-level secures dry cellars. In extreme wet seasons, those containing water are only exceptional. Our swamps are free from malarial emanations.

Have had no epidemics. The catarrhal diseases have been dysenteric in character but amenable to treatment. There have been a few sporadic cases of measles and scarlatina simplex.

CUMBERLAND COUNTY.

DEERFIELD TOWNSHIP. *Report from* CHAS. C. PHILLIPS, M.D.

It is proverbial that Deerfield township is the healthiest place on the globe; that no one dies until they become old. The health during the past year has been excellent; no epidemics or endemics. During the months of August and September there was a tendency to looseness of the bowels, sometimes amounting to dysenteric character, but no deaths resulted therefrom. No deaths the whole year excepting a few from old chronic causes.

FAIRFIELD TOWNSHIP. - *Report from* E. R. BATEMAN, M.D.

With the exception of three epidemics that have visited us, the year ending October 1st, 1884, has been one of general health, the sickness and mortality being not above that of previous years. During the fall of 1883 there was but little sickness; in the winter of 1883–4 we were visited by an epidemic of measles, of mild type and average intensity; no deaths. Mumps also occurred epidemically at the same time, and extended later into the spring. Pulmonary troubles prevailed to the usual extent, and during February and March a few cases of influenza, which had been epidemic the year before, were met with.

No cases of scarlet fever or diphtheria are reported. Typhoid fever moderate, and about the same as previous years. Several cases of remittent fever met with in the spring and fall, and few cases of intermittent. Tonsillitis was quite prevalent during the winter and early spring. There was an unusual amount of bowel trouble during the summer; also a widespread and thoroughly-spread epidemic of dysentery. Cases were met with of all grade, from the simple catarrhal to the truly malignant.

HOPEWELL TOWNSHIP. - *Report from* CHARLES H. DARE.

The surface of the land being undulating, there is no need of any system of drainage, as rain-water runs off, and in no portion of the township does it stand in pools after a storm. The cellars are dry, and much above the water-level.

There has been, during the late summer and early fall, a fatal epidemic of hog cholera, so called in the lower portion of this township, along the line of the Cohansey river. In one instance thirty-two hogs and pigs, out of a drove of about one hundred, have died, and in other instances a like proportion have been lost. The causes leading to the disease are to me unknown, but should be vigorously investigated.

The almshouse of the county is located in this township. Since my last report, this institution has been greatly enlarged and otherwise improved, giving it much more room, which has been long needed. Bath-rooms with hot and cold water have been introduced. The institution is heated in all parts by steam. It will now compare favorably with any almshouse in a county of like size in the State.

LANDIS TOWNSHIP. - *Report from* E. H. FOOTE, *Sec'y.*

Houses generally have cellars, which are used to store vegetables to a considerable extent.

The slaughter-houses have engaged the attention of the Board the past summer to some extent. Wells near the pens have been closed and new ones dug not less than fifty feet from the pens. Now the question is, how to dispose of the offal, so as to banish the hogs that are fed on it, or to reduce the number to a minimum to devour the offal.

MILLVILLE. - - *Report from* T. C. WHEATON, *Sec'y.*

Water is secured from private wells. There are water-works in the city owned by a private company; very few citizens use the water from them for drinking purposes.

No sewers in the city—drainage is all surface; the main gutters are flushed weekly. Very little malaria.

Very few cesspools are cemented; they are cleaned by horse and cart, after and before certain hours of the day and night.

ESSEX COUNTY.

BLOOMFIELD TOWNSHIP. - *Report from* CHARLES H. BAILEY.

The township, by a contract made with the East Orange Water Company, has introduced water under pressure in the streets. The contract is made for ten years and is to the full limit allowed by law. Its introduction in dwellings is not very general as yet. The driven well is in general use.

Most of the cesspools are now cemented, and as the soil is a coarse gravel they do not fill fast. Most are emptied by the "Odorless Company," of Newark. In some cases, when houses are far apart the contents of the cesspool is pumped on the lawn or garden.

We have been spared from much sickness and have had no epidemics during the past year. The decrease of malarial diseases has been remarkable, and may in some measure be due to the draining and filling in of wet places secured by preceding Health Boards and the Village Improvement Society. It is proper to say that this policy has been continued by the present Board.

ORANGE. - - *Report from* THOS. W. HARVEY, M.D., *Sec'y.*

The Board of Health has little to report this year beyond routine work. There has been much less sickness than usual and no epidemics present. The usual inspections and the looking after nuisances were made more thorough than usual; our assistant inspectors were appointed for three months instead of by the day.

A committee was appointed, consisting of the Health Inspector and the City Physician, whose function is to take charge of any cases of

epidemic disease, particularly cholera or small-pox, and arrange for the proper isolation. They are further empowered to employ summary measures to stamp out and prevent the spread of these diseases on their first appearance.

When such a case occurs among the poor, where isolation is possible, it is to be enforced at once. Where removal is necessary the patient is to be taken in our own conveyance to a pest-house, the site for which we own, and which we are in position to erect on twenty-four hours notice. A disinfecting corps will be organized, which will take charge of all premises occupied by cholera patients, and who shall thoroughly disinfect the surroundings of the patients and destroy all substances that may convey the poison, as bed-clothing, body-clothing, &c.

Disinfectants are always at our headquarters, to be had for the asking.

When cases occur among the well-to-do, the Board of Health will insist on the same care in isolation and disinfection as in the other cases. We feel that in the case of Orange we can control cholera when in our midst. We only fear the danger that will arise from the many new cases that will arrive in town from outside places, and which will come to the knowledge of the Board too late to prevent conveying infection to others.

South Orange Township. *Report from* A. A. Ransom, M.D., *Sec'y.*

Have Board of Health and all the law necessary to enforce demands. Have educated the people to take a more active interest in sanitary affairs.

Supervision of contagious diseases and vaccination confided to physician of Health Board.

Prevailing disease, lung trouble. But little, if any, intermittent since the drainage was finished in 1882.

GLOUCESTER COUNTY.

East Greenwich Twp. - *Report from* Elmer Bradshaw.

We have but little swampy ground, and seldom a case of malaria.

There are no sewers used. Cesspools are built with open bottoms, and are emptied with horse-cart and shovel.

There has been no prevalent disease among human beings. Several horses have died with blind staggers. We cannot give the cause, nor do we have a cure. A number of hogs have died with (so called) hog cholera.

GLASSBORO TOWNSHIP. *Report from* JACOB ISZARD, M.D., *Sec'y.*

The water-supply is from wells and of a good quality.

The drainage is not so very good on account of the flatness of the soil. Since last year there has been a terra cotta pipe laid several inches below the surface of the earth, to carry off the surface-water during rains or melting snows, which has improved the sanitary condition of the lower portion of our town. The length of the pipe is one-third of a mile, and it has cost the township about six hundred dollars. It has proved very satisfactory to the inhabitants in the central part of the town.

The streets and public grounds are kept in good condition.

The refuse is fed to pigs and chickens. The excreta is hauled out of the town by farmers, who ask to remove it on their farms as a fertilizer, which is generally done in the winter time.

Slaughter-houses are built out of the town and the offal is fed to swine.

The public health laws and regulations are adhered to in case of contagious diseases.

The town has had less malaria the past year than it has for many years.

GREENWICH TOWNSHIP. - - *Report from* JOHN STETSER.

This township may be said to be thoroughly drained.

The hog cholera is raging at present, sweeping away whole pens, leaving the farmers pigless. Precautionary measures seem to have proved useless.

Careful arrangements have been carried out to prevent the accumulation of filth so as to become a nuisance and offensive to neighbors.

Scarlet fever was prevalent during the winter and spring months. A few cases of diarrhœa and dysentery occurred during the summer months.

There is a marked improvement in the sanitary condition of our township within the last few years by the removal of the causes of diseases, as well as the abatement of nuisances, by inspection and legal notice.

HARRISON TOWNSHIP. - *Report by* E. E. DEGROFFT, *Sec'y.*

During the summer and fall months there has been an increase of malarial and typhoid fevers over last year, attributable, in two or three instances, to bad water-supply, and damp cellars or imperfect drainage.

Although the character of the disease has been of a lower type than formerly, the mortality has been no greater.

A hog disease has been prevailing in this township during the past few months to an alarming extent. Some persons losing as many as sixty (60) in a month.

In my opinion it is not so much the hog cholera as so many farmers think, but, in many instances, it is a true case of cerebro spinal meningitis. The symptoms are loss of appetite, high fever, vertigo, an eruption along the spine, at times bowels constipated, and, in other cases, diarrhœa, and occasionally there is hemorrhage from both nose and bowels.

We believe it to be highly contagious, and, indirectly at least, hazardous to public health, and that it should demand the immediate attention of veterinary surgery.

LOGAN TOWNSHIP. - - - *Report from* S. B. PLATT.

Surface drainage principally. The water level is such as to secure dry cellars with some few exceptions. In the past year there has been interest taken in the drainage of cellars, and where there has been water or likely to be, a system of tile drainage leading to a natural water-course has been adopted.

No sewers used; waste water generally allowed to run two or three hundred feet from well and remain on surface. Water-closets or privy wells generally situated two hundred feet from water-supply, and in many cases are not water-tight, having open sides and bottom. Are trying to correct the evil of open privy vaults and have met with some success, as all or nearly all being built are cemented on sides and at bottom.

During the past summer blind staggers among horses have been prevalent in the district and in every case fatal, there being sixteen in all. Two cases were reported as staggers, but on examination after death were found to be lung fever. No contagious or epidemic disease of cattle reported. Three cases of hog cholera were reported

in this district, all fatal, while in the adjoining district over one hundred hogs died with the disease.

One slaughter-house in the district, and that in a very bad sanitary condition.

Have adopted sanitary code under laws governing local Boards of Health and circulated them through the district, which has had a good effect except as to drainage of waste water, slops, and privy vaults and slaughter-houses, which we hope to succeed in the coming year without summary measures.

Vital statistics are well reported by physicians, undertakers, nurses, &c.

Have had some few cases of contagious diseases where it was deemed necessary to isolate them, and the instructions were generally complied with. The system of vaccination is not accepted very generally, as we have one man in the district who makes it a point to denounce vaccination in every form upon all occasions.

During spring and first summer month, about thirty cases of diphtheria, one case of which proved fatal. Scarlet fever prevalent in winter and early spring; five cases fatal. All the fatal cases confined to two families.

WASHINGTON TOWNSHIP. *Report from* F. W. HURFF, JR., *Sec'y.*

This township has no system of drainage or sewerage. There are portions of the township where there is considerable standing water after heavy rainfall, and in the vicinity of this standing water wet cellars abound.

On the line of the township, near the Camden county almshouse, is a pond of water which has caused some complaint. The head of this pond is near the house of Mr. Joseph Willits, and, as the meadow is very flat, it causes stagnant water to stand, which is said to cause fever and ague and malaria. The body of the pond being in Camden county, our Board felt that they had no jurisdiction.

We have no system for removing refuse and excreta. Privies are usually cleaned yearly.

The water-supply is from springs and wells.

The prevailing disease of the township during the summer has been malarial fever, but I think it has diminished from previous years. In early spring we had an epidemic of measles, but with no fatal results.

Also, in the latter part of summer, we had several cases of typhoid fever of a malignant type, with few deaths.

Hog cholera appeared at Hurffville during the summer, and has spread nearly all over the township. It has proven fatal in almost every case. Some of the farmers have lost their hogs after having them fatted.

HUDSON COUNTY.

HUDSON. - - - *Report from* C. J. ROONEY, *Sec'y.*

In accordance with your request, I beg leave to present the following brief report on vital statistics, &c., of Hudson county, and cities, towns and townships thereof, for the year ending June 30th, 1884.

An outbreak of small-pox took place in Hoboken in July, 1884. The cases were few; prompt vaccination was enforced by this Board and the disease quickly disappeared.

As compared with the reports for ten years, there was a decrease in the number of deaths from croup, diarrhœal diseases, diphtheria, scarlet fever, and an increase in the mortality from typhoid fever and measles.

Consumption's rate continues high—thirty per ten thousand. This is higher than for any year but 1882, when the rate rose to thirty-two. The lowest rate was twenty-four, in 1876. I should have remarked an increase in the death-rate from pneumonia when contrasted with our ten-years average.

The whole decrease of mortality, as compared with the ten-years average, took place among children under five years old.

Jersey City's death-rate per 1,000 was $\frac{8}{10}$ below the average for ten years. In this time rates have varied from 20.3 to 27.5. There was a decrease in mortality from zymotic diseases, and an increase from consumption.

Hoboken's rate fell $6\frac{2}{10}$ below ten-years average, and was the lowest recorded in that period. There was a very marked decrease in the number of deaths from zymotic diseases; also, a decrease in the mortality from acute lung diseases.

Bayonne sustained a rate of 17.7, which was $\frac{5}{10}$ below five-years average. There was a decrease in the mortality from acute lung diseases as compared with the five-years average.

Harrison town exhibited a rate of 26.2—just up to its quinquennial average rate.

Town of Union, with a rate of 20.1, fell about 5 per 1,000 below five-years average. There was a marked decrease in the number of deaths from zymotic diseases, and a diminution of mortality from nervous diseases.

West Hoboken township had a death-rate of 19 per 1,000, which was nearly 3 per 1,000 below five-years average. The greatest decrease was among acute lung diseases.

Town of Guttenberg's rate of 27.5 was $2\frac{7}{10}$ above the average for five years.

North Bergen's rate of 46.8 was 6 per 1,000 below the average. The decrease of mortality was among zymotic and acute lung diseases.

Kearny township's rate of 13.5 was $\frac{7}{10}$ above the quinquennial average.

Union township's 25.4 was 1 per 1,000 above average.

Weehawken's rate, 15.7, was 10.2 below average.

NOTE.—On account of supplemental returns, these vary slightly from the State records.

There were more deaths from the heat in July than for the same month of the previous six years.

With the exception of May and June, 1884, the county death-rate for every month of the period now reviewed, fell, as compared with the average for seven years.

A notable feature of the reports was the decrease of Hoboken's rate, in every month, as contrasted with average for ten years.

Certain additional ordinances were prepared by the counsel of this Board, John A. McGrath, Esq., at the Board's suggestion, and passed by the Board.

These ordinances are designed to provide a system of licenses and permits in the case of certain offensive trades and manufactures, and also in the case of the keeping of swine, cows, &c. They also give the Board control of the traffic carried on in emigrant-bedding from European steamers. A registry of cattle-owners is also provided for, in accordance with the suggestion made by yourself.

These ordinances seem to give promise of well fulfilling the object of their enactment, and, to some extent, prove a source of revenue to the county.

The schedules sent out from this office, in conformity with your request, are not as fully written up by the cities, towns and townships as might be desired. Much of the information, I am informed, it is well nigh impossible to obtain without much labor and expense.

A very thorough inspection of schools was made by this Board, and the result was embodied in a report to the Board of Chosen Freeholders, who ordered it printed in the various official newspapers of the county. It drew attention to many needs of the schools of a pressing character, and it is to be hoped that it will result in an improvement, where feasible.

BAYONNE CITY. - - - - - - ——— ———.

As a general thing no cellars. Basements not occupied. City has about four and a half miles of sewers. No cesspools, or very few.

HOBOKEN. - - - - - - ——— ———.

Water-supply from the Hackensack river, taken about four miles above the town; place called New Milford. Supply furnished under contract by the Hackensack Water Company.

NORTH BERGEN TOWNSHIP. - *Report from* CHARLES PINNELL.

Our principal supply of water is from wells and springs; a part of the inhabitants are supplied by the Hackensack Water Company, whose main passes through the township; a private corporation; our county institutions at Snake Hill are supplied by the Jersey City Water Company; the water is often discolored, water soft, bad at certain seasons of the year. The Jersey City Water Company receive sewerage above the point of supply.

As to drainage, the natural drainage of the northern part of the township was formerly by water-course emptying into Bellman creek. This water-course is the county-line between the counties of Hudson and Bergen, and has become entirely filled up. After repeated efforts to get the two counties to open the water-course, the efforts of the inhabitants of that district have entirely failed.

JERSEY CITY. - - - *Report from* GEORGE T. BOUTON.

Analysis of Passaic water made October 11th, 1884. Sample received October 3d, 1884, from office of Board of Public Works.

Taste and smell both woody.

	Parts in 100,000.	Grains per gal.
Free Ammonia	0.022	0.0129
Albuminoid Ammonia	0.027	0.0157
Oxygen required to oxidize organic matter	0.38	0.22
Nitrites	0.0002	0.00012
Chlorine (enormous amount)	2.15	1.25
Total hardness	4.2	2.45
" solids	15.05	8.76
Oxygen required (Silver)	0.62	0.36
" dissolved in one liter = 5.1 cc.		
Carbonic acid " " " " = 0.8 "		
Nitrogen " " " " = 14.0 "		
Total gas, - - - = 19.9 "		

Acid reaction equivalent to 0.49 pints Sulphuric acid per 100,000.

Note the great amount of dissolved solid matter, especially chlorides, and the corresponding effect upon the hardness.

The æration is very insufficient and the oxidation of organic impurities correspondingly imperfect.

HUNTERDON COUNTY.

DELAWARE TOWNSHIP. *Report from* ASA H. HOLCOMBE, *Sec'y.*

The general health of the township has been excellent. Malarial fever of all varieties, which has prevailed in the past few years, has to a considerable extent been checked. Cases of it are not as numerous the past year. The majorities of the cases being confined along the banks of the river Delaware.

There has been only one complaint against nuisance; and that was promptly attended to and abated. No general vaccination has been ordered by the Board and precaution is exercised in all cases of contagious diseases.

EAST AMWELL TOWNSHIP. - - *Report from* P. C. YOUNG.

Measles, dysentery and a few cases of cholera morbus during the hot months of the summer have been the most prevailing diseases of the township.

BOROUGH OF FRENCHTOWN. *Report from* GEO. C. LANDON, *Sec'y.*

Cesspools are the main reliance for disposing of the kitchen waste-water and slops. These cesspools are mainly holes dug in the ground

some few yards from the kitchen, into which, by means of a drain the kitchen waste-water is carried. These cesspools are usually covered, and more or less frequently emptied and purified, as the families are ignorant or well-informed upon their influence on health. Slaughter-houses are looked after whenever there is any complaint made, but not otherwise. There do not seem to be any prevalent diseases. There have been some few cases of dysentery and some cases of malaria, but hardly as prevalent as former years.

Since my last report fire-escapes have been placed on one of the large buildings, in which there are two large halls in the third story. The fire department is in about the same condition as last reported. We are still at the mercy of the fiery elements should they at any time be let loose upon us. We have practically learned but little wisdom since our last great fire.

Our cemetery is so located as not to affect the health of the surrounding country.

We are at this time getting our health ordinances and by-laws into shape, so as to conform to the late laws of the State, and hope to make our Board more efficient than heretofore.

HIGH BRIDGE TOWNSHIP. *Report from* W. C. ALPAUGH, M.D.

No. 61, High Bridge district, has a two-story frame school building situated in a low, wet place, having on the northwest the south branch of the Raritan river; on the southeast a steep declivity, covered with wood, extending within twelve feet of the house; and on the southwest the Central Railroad embankment, which is about one hundred feet high and two hundred yards from the grounds. Such surroundings make it a damp, unhealthy place. In the winter the sun does not shine on the house more than three hours in the day. The water-closets are above the well, so that the drainage is from the closets to the well, which make the water unhealthy to drink. This district employs four teachers, and has three hundred and fourteen scholars.

No. 60, Silverthorn district, has a one-story frame house, situated on high grounds and with a good drainage. It has two teachers, and one hundred and thirty-nine pupils.

No. 59, Rocky Run district, has a one-story frame house, and is situated in a low, swampy place, with very unhealthy surroundings. It employs only one teacher, and numbers sixty-one scholars.

No. 65½, Mount Grove district, has a new frame dwelling, situated on high, dry ground, good drainage and a healthy surrounding.

Our township has been quite free from contagious diseases; very little malaria. Bronchial diseases have been quite prevalent; a few isolated cases of typhoid fever and diphtheria.

LAMBERTVILLE. - - - *Report from* JOHN C. MOORE.

No system of sewerage. Many of the cesspools are built of rough stones not cemented, the others are made by sinking hogsheads or barrels in the ground. The liquid matter escapes in the surrounding earth, the solids mostly removed.

No new manufactories. A tomato canning factory has run its refuse in the past years into the underground drain or sewer, and thence into the bed of Swan's creek (nearly dry in summer in city limits), which is situated in a thickly-settled part of the city. Complaint was made to the Board of the horrible stench during the canning season. The Board of Health filed a bill in chancery for an injunction restraining the proprietor of the factory from running his refuse into the sewer, &c. The injunction was granted. (Opinion by Vice Chancellor Bird, filed October 17th, 1884. *Case*, Board of Health of City of Lambertville v. Butterfoss.)

LEBANON TOWNSHIP. - *Report from* A. S. BANGHART, *Sec'y.*

The past year has been healthy. No epidemics have been with us until this fall, when a few cases of typhoid fever occurred in the Junction, but no cases died.

TEWKSBURY TOWNSHIP. - *Report from* O. A. FARLEY, *Sec'y.*

In our report of last year we stated scarlet fever as being prevalent, the number of cases being one hundred and fifty. Within the past year there have been but few cases, numbering about ten. Malarial fever is on the increase.

Three cases of typhoid dysentery occurred in the village of Mountainville, in a family named Wise (a miller by trade), and two deaths resulted. The supposed cause was traced to a spring situated near the house; said spring being so located as to receive deleterious substances that emanated from pig-pen, barn-yard, &c. The use of the spring being abandoned, no further trouble ensued in the family.

MIDDLESEX COUNTY.

MONROE TOWNSHIP. - *Report from* WM. E. PAXTON, *Sec'y.*

As to drainage: In the country districts they drain by regular drain-pipes or tile, and in our village we have large ditches in which are large drain-pipes, and from the properties that need draining, smaller pipes are run to the main or larger ditch. The most of our property is not troubled with wet or damp cellars, but where there are such they are drained as above stated. We are not troubled with chills and fever.

NEW BRUNSWICK. - *Report from* HENRY R. BALDWIN, M.D.

Many of our thoroughfares are in such sad need of repair, that during, and immediately after heavy rains or showers, they afford a lodgment for pools of water. Many of the unpaved streets are improperly drained and the ground is sodden with filth and moisture; such conditions are certainly highly insalubrious.

Our public health laws are defective. The local Boards of Health are not clothed with sufficient powers in certain quarters, and these powers can only be conferred by the municipal body. For instance our Board of Health has no power to compel connection with the sewers even where such course is manifestly for the public good, and thus far common council has failed to grant such power.

Our sanitary expenses are mostly confined to the salary of the sanitary inspector, owing to the fact that we have no superabundance of money. The people vote to appropriate five hundred dollars a year to the Board of Health, but the Board never has funds in hand to meet any emergency, since this sum of five hundred dollars is never paid into the treasury of the Board. We expend as little as possible, send all bills to the common council, and that body orders payment or not as thought proper. Comment seems unnecessary.

We are extremely happy to be able to report that the past year has been remarkably free from epidemics of any kind, and we feel confident that in this respect at least we are much to be envied by many of our sister cities throughout the State.

The tabulated report on vital statistics submitted to this Board by our careful and efficient city clerk, Mr. Edward Tindell, shows that

there were one hundred and thirty-four marriages, five hundred and forty-one births and four hundred and twenty-six deaths during the year. In this report Mr. Tindell says: "The above table is interesting as showing a greater degree of accuracy and carefulness on the part of physicians and midwives in reporting statistics of births and thus conforming to the requirements of the law. Of the four hundred and twenty-six deaths, thirty-two or about thirteen per cent. occurred outside the city limits in the adjacent townships. Compared with the report of last year the death-rate is low, as here shown:

1882–1883.......	Marriages, 161.......	Births, 425.......	Deaths, 515.
1883–1884.......	Marriages, 134.......	Births, 541.......	Deaths, 426.
Decrease of	Marriages, 27.......	Births, 116.......	Deaths, 89.

This Board deems it to be its duty to call the attention of the State Board of Health to the following case of malpractice, although occurring beyond the city limits, and therefore beyond the jurisdiction of this Board. Complaint was made against one person, who attempted the treatment of a surgical case (in fact he stole it from the regular physician who was in attendance), without having a registration in the office of the county clerk, in accordance with the requirements of the law. An indictment was found by the grand jury, but the public Prosecutor failed to get a verdict of guilty, as the defendant pleaded he had received no compensation. Should we not have an amendment to the statute?

PERTH AMBOY. - - *Report from* CHARLES K. SEAMAN.

The city water-supply continues to be a subject of concern. There are very few good wells in the city, and these are in danger of becoming contaminated as the city becomes more thickly populated. The water furnished by a private company is supplied by springs and surface-water, and is used by about one hundred and twenty private houses. The water is soft and without any taste of iron, but is so badly discolored by clay as to be unfit to use for washing purposes, and few have the courage to drink it.

Strict attention is paid to incoming vessels, and all coming from infected ports pass a rigid quarantine. There has been some scarlet fever and whooping cough since summer, and a few cases of diphtheria. Malarial diseases have not decreased much.

MERCER COUNTY.

HAMILTON TOWNSHIP. - *Report from* WILLIAM T. YARD, *Sec'y.*

Our township has been in good health. The death-rate is one-third less than last year. We have not had any complaints from slaughter-houses. We have several in our township, but they are kept in good order. We have had the garbage from the city of Trenton stopped from being dumped on the vacant lots on State street road. The night-soil carried to one of our farms is a source of annoyance to the Board. It is hard to keep the oderless company from dumping on the farm and not covering it up. It is left on the top of the ground unless some one of the citizens reports to us, or we find it out ourselves by investigation.

The water-supply is short, it being so dry that the wells are very low, and a great many of them entirely dry.

MILLHAM TOWNSHIP. - - *Report from* JOHN J. CLANCY.

As to drainage: There is no system of drainage; there is no sewerage; there is a point between canal and creek where the cellars are usually wet; there is also a bad swamp adjoining and owned by the Pennsylvania Railroad, that is always in a very bad condition, and there is a large number of cases of malarial fever; we are never without some cases of fever at all times of the year.

This swamp mentioned in D, is, in my opinion, largely the cause of so much chills and fever; it is in the summer time in a very filthy condition; it has on its surface a thick green substance; it is, I think, an overflow from the canal.

CITY OF TRENTON. - *Report from* WILLIAM CLOKE, *Sec'y.*

During the year physicians have reported to this office the following cases of contagious diseases: Diphtheria, thirty; scarlet fever, forty; scarlatina, three; typhoid fever, four. This does not, probably, include all the cases that have occurred in the city, as some physicians, either through ignorance or neglect of the law, fail to report their cases. But it may confidently be stated that Trenton is remarkably exempt from what are known as "filth diseases." This exemption is no doubt

largely due to our exceptionally good and wholesome water-supply. This supply is drawn from the middle of the Delaware river, and is twice filtered before it reaches the consumer. The water of the Delaware at this point is almost absolutely free from artificial pollution, as there are no towns or villages or manufactories within many miles of the city that empty any waste or sewage into it. There are but very few large towns and villages on the river between Trenton and the headwaters of the river, and but very little polluting matter turned into it. The large volume of its flow and the ruggedness of its bed and rapidity of its flow completely eliminate every vestige of such slight impurity long before it reaches this city.

Other reasons for our exemption from filth diseases are: the topography of the city, affording fine grades for the rapid carrying off of water and waste; the vigilance of the Board of Health and its faithful and indefatigable inspector; and the general and intelligent regard of our citizens to the requirements of sanitary laws and government.

During the year about one thousand privies and cesspools have been emptied, and about five hundred other nuisances of various kinds have been abated.

The Board made a test case before the Court of Chancery against persons polluting the stream known as "Petty's Run," by bringing suit against the proprietors of the American House Hotel for sewering into said run. The case was vexatiously prolonged, but a decision was recently rendered by Vice Chancellor Bird, fully sustaining and upholding the Board. The case has been appealed to the Court of last resort, but we confidently expect a favorable issue.

The project of securing a general system of sewers for Trenton is well under way under the auspices of the sanitary committee of common council. Mr. Rudolph Herring, of Philadelphia, has been employed to make the surveys and prepare a plan, and this is expected soon to be ready for submission to the common council. It is hoped to have the new system begun next spring, as soon as the weather will permit.

In view of the possible appearance of cholera next summer, the Board is adopting every possible precautionary measure.

MONMOUTH COUNTY.

ASBURY PARK. - - *Report by* HENRY MITCHELL, M.D.

An ordinance was adopted by the Commissioners of Asbury Park, June 3d, 1884, re-organizing the Borough Board of Health.

The Board has continued its routine work with little change in the general plan pursued during the previous year. House-to-house inspections, and a record of the facts in this way learned, have been the regular duty assigned to the assistant sanitary inspector, the record sheets being corrected to show the condition of each premises at each inspection. The facts gathered and recorded by the inspector are examined by the executive officer of the Board, and a memorandum is made of all cases requiring attention.

The ordinary procedure is then, as follows: Notice is sent by the clerk to all persons who are found to be violating any of the provisions of the Sanitary Code. Re-inspection is made when the time named in notice has expired, and if the conditions complained of have not been remedied, the case is brought to the attention of the Board at its next meeting.

Cases of an unusual or especially dangerous character are at once referred by the executive officer to the sanitary committee, who proceed with an investigation. Suit is begun, as a rule, only upon the recommendation of this committee. The effort to get rid of leaching privy-vaults has been successful, and not one is now in use in the borough. The principal undertaking of the Board during the past year has been to abolish leaching cesspools. In this endeavor we are making satisfactory progress, there being now only a few such structures within our limits.

There are 808 dwellings in Asbury Park, and more than 700 of them are provided with suitable means for the disposal of waste liquids.

The sewers have performed their duty in a very satisfactory manner, and no difficulty has occurred in connection with them during the year.

Time seems to be showing that with our system, and in this location, no practical objection exists to casting sewage into the sea.

There are one or two features connected with the sewer system in Asbury Park, which may be here briefly referred to. 1st. All of the sewage is strained by passing it through gratings having three-quar-

ter inch openings. This was undertaken to prevent discharge of paper and other material which might be visible and objectionable when it reached the ocean. The gratings are placed on each premises connected with the sewer. In cases where water-closets are used, a catch-basin is inserted in the course of the house-drain, and placed as near the house as is practicable. The trap on the house-drain is placed on the sewer side of the catch-basin, and the grating is placed over outlet from catch-basin. The cover of the catch-basin is hinged and perforated, and serves as the cold air inlet for the soil-pipe. 2d. Automatic mechanical ventilation has been secured for the receiving vault on the beach. This has been accomplished by connecting the twelve-inch discharge-pipe with the top of the vault by a branch. When the gate guarding the outflow of sewage is closed, the sea continually rushes into and flows out of the twelve-inch pipe; and before the branch connecting this pipe with the top of the vault was introduced, a water-hammer was formed against the gate. By venting the twelve-inch pipe a few feet from the gates, the water-hammer was prevented, and by conducting the vent into the receiving vault near its top, a puff of air is sent into the vault by each succeeding wave, and, in turn, a puff is sent out of the ventilator connected with the vault, thus securing continuous stirring of the air in the vault. The streets of the borough have been kept in admirable condition, and, during the past summer the dust nuisance has been overcome by thorough street sprinkling.

The artesian well which was sunk last year in this borough, continues to flow without diminution, and the quality of the water remains unchanged and is excellent.

Another well is now being bored at the corner of Kingsley street and Asbury avenue.

During the past year gas has been introduced into the borough, but it has not yet come into general use.

Garbage is carted away by the public carts, daily during the summer, and twice each week during the winter. Rubbish is also carted away at public expense. Excreta is mainly disposed of by means of the sewers. Licensed scavengers excavate privy-pits when necessary, and cart the night-soil several miles back into the country, where it is composted for use as a fertilizer.

There are no slaughter-houses in the borough.

Livery-stables and fish-markets have proved to be the most objectionable business places with which we have to deal.

No disease has been prevalent in this district during the past year. We have not had a case of typhoid fever, diphtheria or small-pox during the year, and no death from any zymotic disease has occurred. We have found authority in the laws now on the statute books for nearly all measures necessary to effectually carry on the work of health protection, but wish to call attention to two needed additions to the laws now in force. 1st. Provision should be made for the creation of health inspectors and assistant health inspectors, and definite authority should be given local Boards of Health to order inspections of private property. 2d. There should be authority for the making of ordinances which will provide for the ventilation of privies, cesspools and other stationary receptacles for filth.

EATONTOWN. - - - *Report from* E. W. CRATER, M.D.

Water-supply mainly from Shrewsbury river and small branches fed from the ocean, and all subject to tide fluctuations.

Refuse allowed generally to take care of itself. Closets cleaned occasionally, at owner's expense.

Scattering cases of dysentery, intermittent and remittent fevers.

FREEHOLD TOWNSHIP. - *Report from* W. J. MCCLURE, *Sec'y.*

So far as healthfulness is concerned, we have been exempt from contagious diseases; an occasional case of scarlet fever or measles, which has yielded to prompt treatment, and no epidemics have prevailed.

We are without any system of drainage, and recourse is had to cesspools, many of which are improperly constructed and prove to be nuisances; many privy vaults are in like condition, but we hope by due persuasion to have the evils remedied. Some of these cases have been complained of, and, after due notice from the Board and knowledge of the law, the nuisance has been abated.

Our Board had occasion to visit the jail in July, which was found to be in a very unsanitary condition. Notice served upon the county board of freeholders had the desired effect, and the premises have undergone a complete overhauling; the cells and interior have been thoroughly cleansed, painted and white-washed. Our Board is of the opinion that the present accommodations, (there being only one water-closet and one bath-tub) is inadequate for the number of per-

sons in confinement, there being at the time of the visit more than thirty persons, and latterly the number has increased to over fifty.

A large cesspool in the yard in the rear of the jail, receives all the liquid and solid matter, which is conveyed away frequently in a tight box wagon, but from the rapid accumulation it occasionally becomes offensive. There is no ventilation except from the top (man-hole), and the Board has advised the running of a pipe to a point above the jail of sufficient size to carry off the gases.

Another matter which we have not as yet been able to remedy, is the fouling of a water-course which occasionally becomes offensive from accumulations, stagnant water and slops from house drains.

We have not as yet published any ordinances, but before another season expect to take such measures as will insure our town against sickness or anything that may seem objectionable, so far as is possible.

A matter that calls for special attention is the hog-pen nuisance, and we have on hand your printed letter to F. H. Lum, Chatham, which we consider applicable to our case.

LONG BRANCH. - - *Report from* E. B. BLAISDELL, *Sec'y*.

Extra precautionary measures have been taken to put Long Branch in the best sanitary condition possible, in view of the possible visitation of contagious diseases, or the advent of Asiatic cholera in the spring. The Long Branch brook has been cleaned out from its mouth to its source, involving a large expenditure of money. This was a judicious movement, as the brook was obstructed by branches of trees, and in some cases, despite the vigilance of the inspector, had become the dumping-place of much rubbish, vegetable and organic matter.

During the fall $125 was paid to Mr. George Waring, a civil engineer of Newport, R. I., for a report, to be submitted in writing, of a system of sewerage—the thing so long needed by this place. It is hoped before spring it will bear some practical results. If effected it will conduce much to the sanitary condition of Long Branch.

Application has also been made to the city council, who refused any appropriation to the Health Board, to have the main street macadamized, that surface-water may run off and thus prevent the accumulation of debris and mud-holes in the main thoroughfare of the city.

The Board has been untiring in its efforts to abate all nuisances,

and where complaints have been made the sanitary inspector has been diligent in the performance of his duties.

The president, S. H. Hunt, has devoted much time and labor to interest the citizens in the project of sewerage, and many of the non-residents have signified their interest in the movement by organizing a company for the purpose of effecting that which now seems impossible, owing to the opposition to bonding the city or incurring further debts.

MATAWAN TOWNSHIP. - *Report from* BENJ. GRIGGS, *Sec'y.*

There has been erected on the outskirts of the village a soap manufactory, also used for the manufacture of fertilizers from the carcasses of dead horses and other animals, the smell from which has been exceedingly offensive. Complaint was made by persons living in the vicinity, and the Board of Health visited the premises and advised the proprietor to desist the operation, which he promised to do or remedy the evil. Since then complaint has been made before the grand jury of the county, and an indictment as a nuisance obtained, which case is now before the county courts.

There has been more malarial fever in the last six or eight months than we have had for two years past, but mostly in a mild form; otherwise our vicinity has been quite healthy.

OCEAN GROVE. - *Report from* Rev. A. E. BALLARD, *Sec'y.*

The water-supply is still mostly derived from driven wells, and, so far as we can tell, remains uncorrupted. There have been a few cases where it has been suspected that the nearness of cesspools for waste-water has affected injuriously the wells near them. The location of wells or pools in every such instance has been changed.

The water from the artesian well has not diminished in its flow or changed in its purity. It still sends to the surface its fifty gallons each minute. The pipes by which it is conveyed through the Grove were saturated with coal-tar in their preparation and the water tasted of the tar. For this reason it has not been introduced generally. Several of the large hotels and a few of the smaller houses take their culinary and drinking-water from it, and as the tarry taste is disappearing, many more people are expecting to arrange for its use. It is never discolored, has no iron taste, is soft, it is not bad at any season

of the year; its pipes are cleansed by free flushing at suitable intervals and discharging into the sea.

The question of receptacles for water-waste is receiving increased attention. The larger houses have been induced to abandon the cesspools and substitute sewer connections for both pools and privy vaults. But the smaller ones, where there are but few occupants, and are only used during a part of the summer, mostly decline the expense of sewer connections, and the cesspool seems to be the only method left. That the danger of water-pollution from this source is continually increasing is accepted as a fact, and anxious consideration is being given to the subject. Large cemented vaults for the storage of water-waste are costly in construction and embarrassing in discharging, but as yet in the transition from the system where it percolates into the ground from uncemented vaults. There does not appear to be anything better at the present for this class of houses. The true remedy which must eventually be adopted by all, is connecting with the sewer.

There has been a gratifying increase in these connections during the year just past. Ninety-two new places have been added to the list, making altogether at the present time, two hundred and four connections. The extent of pipe already laid is over seven miles. They are cleaned at suitable intervals with water from the lakes forced into them by our steam engine. This grade is regular, on a fall of over twenty feet to one-third of a mile, and at the sea the outlet is both rapid and continuous. Up to this time there has never been any obstruction, and there is no perceptible odor or discoloration of the water for a distance of over three to five feet from its discharge. The taredo worm last fall destroyed the trunk by which the sewage was carried out into the sea, and which had cost us to lay, over four thousand dollars. It has been replaced by a system of galvanized wrought iron pipes bolted to pilings, devised by D. H. Brown, Esq., treasurer, and which appears to work perfectly.

From the pipes through which it is drawn the water from the driven-wells sometimes tastes of iron, and in some cases discolors the tea or coffee made from it.

Except in a small area located in the southern part of the grounds, the cellars are dry. In these exceptional parts they are cemented.

There are now no swamps near to us. The upper part of Fletcher Lake has been excavated to a clear gravel bottom, and its sides filled in with gravel. That portion lying outside, between the turnpike and

railroad, has been filled in from three to five feet in depth with the best material obtained from Elberon, except a few feet, which is now being done under the supervision of the association. The utmost care has been taken to provide for drainage of surface-water into the lake below, and the free flow of the stream above the railway track. Extra large iron pipes have been laid for this purpose and carry all the flow.

The work is pronounced by competent engineers to be of great sanitary value to all the surrounding territory. Upon this property a railroad depot is to be constructed, whose cemented privy vaults will either connect with the Asbury Park sewer, or whose contents will be removed in accordance with the rules of the Board.

The streets have surface-drainage into the sea. The camp grounds are raked over daily and the rubbish carted away.

The parks and other public grounds are frequently subjected to the same process.

The streets are rounded in the center and the surface collections are removed as often as the needs of sanitation or comfort require.

Decaying matter left carelessly upon the ground around dwellings, obstructed cesspools, waste-water thrown upon the surface, rubbish upon vacant lots, garbage missed by collectors, have required incessant oversight, but in no known case have the offensive conditions been allowed to remain.

An official inspection of all the houses in the Grove was made during the past winter, by the secretary and assistants. Defective conditions were remedied by the secretary. The good effects have been felt for the whole of the past summer.

Kerosene is generally used by the people for artificial light, and the streets and shore are lighted with it. Up to this time no serious accident has occurred from its use.

The auditorium uses a gas made from iron combined with chemicals, which has given general satisfaction. A proposition to introduce gas into the Grove through iron mains has been seriously considered.

From about the middle of June to the middle of September the garbage is collected daily, and removed to a distance of over two miles. In the cooler months the removals are made semi-weekly or tri-weekly, as may be needed. Cesspools and privy vaults are cleaned, when necessary, by an excavator at any part of the season, and the contents carried the distance named above and buried. The thick matter which accumulates in these during the season is taken out in

the winter and either composted with muck and lime or buried with the rest.

The sanitary arrangements for tents elsewhere are on the basis of those required of cottages, which demand full provision for water, cesspools and privy vaults.

The houses are all annually inspected with reference to their arrangements for fire, and special attention is given in oversight of the construction of flues while they are building; outside iron fire-escapes are required on all large buildings.

The cemetery is nearly two miles from the Grove, situated upon a high elevation, and the burials are conducted in harmony with the advice of the State Board.

There has been a general compliance with the ordinances of our Board of Health, in the rules and regulations. The general registration and vital statistics are attended to by the officers of the township.

Contagious diseases are reported to the secretary, and a personal quarantine established over them by the secretary in connection with the advice of the attending physician and the regulations of the State Board. There have been four cases of mild scarlatina reported, all of which recovered speedily. Two of typhoid fever, with one death, cause unknown.

The sanitary expenses in sewer outlet, the reconstruction of commodes, the removal of garbage, salary of secretary and policeman, and incidentals, have been large, but have all been met by the Ocean Grove Association, and do not appear on the books of the Board.

In all general matters the secretary has been guided by the published rules of the State Board. In special cases he has endeavored to obtain the advice of its secretary, which has always been freely given.

In the execution of its ordinances the Board has sometimes been compelled to intrude upon privacy and exercise arbitrary power. It has been so sustained by the officers of the Association as to make its work practicable, and in most cases the people have been willing to co-operate with the Board in the arrangements deemed necessary for the public good.

SHREWSBURY TOWNSHIP. - *Report from* RICHARD A. SICKLES.

The water-supply is from wells, and generally good, except in the thickly-settled parts of the township, where in many cases the water

is getting very poor. In the town of Red Bank, containing a population of nearly four thousand, the supply now is entirely from wells, and the water from them is very much contaminated with foreign matter or soakage. The commissioners of the town have made a contract for the erection of water works to supply and be owned by the town. It is to consist of a well fifteen feet in diameter, sixty-four feet deep, to reach the water-bearing sand below the marl, the water to be pumped from the well into a reservoir situated on a hill about one and a half miles distant, the water being forced from the well to the reservoir on the hill by large-sized pumps. The pipes connecting the two are laid. Hydrants for fire and street purposes are stationed at intervals along the main, and connecting pipes to be laid in all the streets in the corporation. The well at the present time is down fifty-six feet, and the water is coming in freely, to the extent of about two hundred thousand gallons per day. Three experimental pipe-wells were sunk to determine the exact depth of the water-bearing sand below the lower marl bed, where the State Geologist was confident an abundant supply of pure water under pressure existed. These experiments prove the correctness of the theory, and at a depth of sixty-three to sixty-seven feet the water rose to within ten feet of the surface. Pumping freely from the pipes showed the supply to be practically inexhaustible. Samples of the water were analyzed by the State Geologist, Prof. G. H. Cook, who reported it pure and soft, unexceptionable for laundry purposes, steam boilers and family use. It is expected that the water works upon the plan adopted will be completed by the beginning of the year.

In all other respects I believe the condition of the township is the same as the report made last year.

MORRIS COUNTY.

CHATHAM TOWNSHIP. - *Report from* I. A. DE HART, M.D.

Complaint was made to this Board of a butcher both as to his slaughter-house and a pig-pen containing twelve pigs, adjoining the slaughter-house, into which all the offal and other refuse was thrown. Notice was served upon him to remove them, and as he did not do so, after waiting a reasonable time the counsel of the Board was instructed to notify him that legal proceedings would be commenced against him at once if he did not comply with the notice sent him.

Numerous other complaints numbering twenty-five have been made to the Board from time to time of overflowing cesspools and privies, foul pig-pens and cisterns. In every case where complaint has been made, an investigation followed by the president and health physician. When nuisance was found to exist, the owner thereof was duly notified to abate said nuisance, and there has been cheerful compliance.

Several cases of scarlet fever occurred early in the summer, from which there were but three deaths. The second week in September a case of diphtheria developed in a child that was visiting one of the families where scarlet fever had previously existed. Four days after the development one of the children of this family was taken ill with it and died with diphtheritic croup. Four other children in the same family also had it, and one of them died after three days' illness. The father has since been very ill with it, but recovered. Three other families, whose children were likewise exposed to the disease by playing with the first child while it had a sore throat, but were not thought ill enough to call a physician, also had the diphtheria. One of these families also had the scarlet fever and lived in the rear of the first family that had diphtheria. There were twelve cases in four families and four deaths. These were all children except one adult, who recovered. Since then there have been three cases, one child and two adults. One of the latter, a lady who assisted in the care of two of the children that died, was taken suddenly ill with diphtheria and died after four days' illness and six days after exposure. The physicians attending these families reported the cases to the Board, and an immediate inspection of all the premises where the disease existed, and also of the adjacent premises, was made by the president and health physician. A bad sanitary condition was found in all the premises. The yard in the year of the residence of the first family attacked, contained two cisterns nearly filled with impure water, and a large privy which received all the waste-water from the sink. This privy overflowed after a heavy rain-fall and ran into an adjoining yard. Both of the cisterns were thorougly cleaned and a new privy vault was built, perfectly water-tight. The owner of the premises would not allow a nuisance to exist on his property at all, if informed of the fact.

The yard of the second family was surrounded by several nuisances, consisting of three privies, all of which required immediate attention, and within six feet of the rear of the house was a pig-pen. The parents said that the stench from the pig-pen was so fearful during the warm

weather that the windows and doors were kept closed, and frequently they were made sick by going out of the back door and inhaling the odor. Nevertheless they endured this after both of their children had scarlet fever, and now both have had diphtheria. Another pig-pen also exists across the street, and directly opposite this house which has just been complained of. The third family had a very foul cistern under the kitchen and a privy within twenty-five feet from the back door. In the rear of the fourth family the yard contained three privies, underneath which were shallow pits to receive the material, and all of them were overflowing. Notices were served on the owners of all the premises inspected to have the nuisances abated immediately and they most cheerfully complied.

Owing to the rapid development of diphtheria, it was thought best to close both the public and Catholic schools for a short period, as many of the children attending the schools were obliged to pass through the infected district in going to and returning from school.

There have been about twenty-five complaints of nuisances made to the Board since June 15th, and all have received due attention and been abated as speedily as possible, except one, which it was thought would require legal proceedings to compel the owner to comply with the ordinance and abate the nuisance; but when he found that the counsel of the Board was about to commence proceedings, he consented to abate it.

Malarial fevers have not prevailed as frequently in our midst during the past spring and summer as formerly, and where they have developed it has been mostly in persons who have previously been afflicted with them. Owing to our high altitude we should be entirely free from malaria. The supply of good water for culinary and drinking purposes in the township of Chatham, and especially in the village of Madison, is very deficient.

There are but few wells, and many families depend upon unfiltered cistern-water, while some have cisterns with a filtering apparatus. There are numerous springs in some parts of the township, and especially in the village of Madison.

Many houses have no sewers or cesspools, but allow the waste-water to run into the garden or street gutters by means of small drain-pipe. A few have cemented cesspools, which are emptied by means of pumps, while others have cesspools with cemented bottoms and sides laid with alternate layers of brick, thus allowing their contents to be absorbed

by the earth. An odorless apparatus has been in use in an adjoining town for the past year, and has been used in our village for emptying cesspools with very good results.

There are two large cemeteries in our township, Hillside and Catholic, and a small cemetery where a few families bury.

Our secretary, who is township assessor, keeps a record of vital statistics.

During the prevalence of diphtheria the laws of 1883, relating to public funerals of those who die with contagious diseases, were published in our weekly paper so that all might be informed of their existence.

HANOVER TOWNSHIP. - *Report from* G. A. BECKER, M.D.

There have been a few mild cases of scarlatina, with one fatal case, during this year. Malarial diseases have been on an increase, due, probably, to the wet season followed by the drouth. The southern portion of the township is low meadow land, and after heavy rains or protracted wet spells is nearly all under water, and then, when a hot, dry spell succeeds the wet spell, there is a great deal of decomposing vegetable matter.

PEQUANNOCK TOWNSHIP. - *Report from* E. W. MARTIN, *Sec'y.*

There has been no contagious disease among us. The subject of vaccination has been attended to.

WASHINGTON TOWNSHIP. - *Report from* E. C. WILLET, *Sec'y.*

The supply of water in this township is mostly springs, and the drainage of the township as a general thing is natural.

We have but one slaughter-house in the township. There has been no complaint against it. It is kept in better condition than formerly.

Our school-houses through the township are in good order and well ventilated.

There has been no prevailing epidemic this year. Malaria we have had to some extent; some few cases of dysentery; pneumonia, but few cases.

MORRISTOWN. - - *Report from* CHAS. H. GREEN, *Clerk.*

Our water-supply is from springs; furnished by the Morris Aqueduct Company. Streets are kept very clean and in good order; the principal streets are macadamized. Cesspool system. No sewers.

Refuse is deposited on public dumping ground, buried in trenches.

Two burying grounds in city, but seldom used; two cemeteries out of city limits.

Quarantine when necessary, and contagious diseases looked after by health physician. Expenses about eight hundred dollars.

OCEAN COUNTY.

LACEY TOWNSHIP. - *Report from* FRANKLIN MATHEWS, *Sec'y.*

Well-water is used. Cellars wet, contain water often. No malaria. Two school-houses, in good condition. Vaccination not well kept up. Pneumonia and typhoid fever.

PASSAIC COUNTY.

MANCHESTER TOWNSHIP. *Report from* JOHN H. VAN HOUTEN.

No sewers in the township. Cesspools, where used, are generally with open bottoms and sides, and are emptied by having contents taken out by buckets. If slops and water, these leach through the ground, and then, what remains, is shoveled out and taken to the manure or compost heap.

CITY OF PASSAIC. - - *Report from* F. H. RICE, M.D.

The health of the city has been unusually good for the past year. No epidemic or prevalent disease has invaded the city. Malaria decreases year by year. The old arrangements for the water-closets still prevail, but are growing less popular. The water-supply comes from the Passaic river, but for drinking purposes cisterns and driven wells are mostly used. The Board have called the attention of the city council to the necessity of having a system of sewerage at once. They have taken initiatory steps to secure the same. So, by another year, we hope to have the city sewered, or some part of it at least.

PATERSON. - - *Report from* WILLIAM K. NEWTON, M.D.

In our report for the year ending October 1st, 1883, we outlined the facts relating to items A, B, C, D, H, K, R, S, T and U in the schedule.

Under water-supply we would add to last year's report by stating that we have availed ourselves of the provisions of the supplementary health law of 1884, and have passed an ordinance relating to the water-supply. Each well in the city is being examined, and the water thereof analyzed by the health officer. Eleven public and three private wells have been ordered closed or unused.

One mile of new sewers has been completed this year. Under authority given by the Board of Aldermen, we have ordered three hundred and forty-eight houses connected with the public sewers, where such connections did not exist.

A form for the sanitary survey of a house has been prepared, and we shall be able to report in a year after the statistics shall have been tabulated.

We have made but little headway in methods of disposing of house-waste. Two odorless companies now do all the work of removing night soil, all other methods being prohibited.

A thorough inspection of our schools is to be made this winter.

The system outlined in our last report has been followed out to our satisfaction. During the year embraced in this report five hundred and forty-seven nuisances have been abated. Prosecutions before the recorder have been rare, and penalties not to exceed forty dollars in all have been imposed.

The clerk of the board of aldermen is, by virtue of his office, register of vital statistics, and not being a physician, and taking no interest in the subjects, vital facts of great value are not used. The board of aldermen has been petitioned to assign this work to this Board, but for political reasons have so far refused to act. In the meantime figures of extreme value to us in the study of the sanitary condition of the city go for naught. We hope for a change in the future.

The plan noted in the report for 1883 has been followed out with partial success. The following cases of contagious diseases have been under our care:

DIPHTHERIA.

		Cases.	Deaths.
1883.	October	9	5
	November	12	6
	December	15	6
1884.	January	24	6
	February	8	2
	March	11	3
	April	9	–
	May	2	–
	June	1	–
	July	2	–
	August	2	1
	September	3	–
	Total	98	29

Percentage of deaths to cases, 29.59 per cent.

SCARLET FEVER.

		Cases.	Deaths.
1883.	October	41	6
	November	69	9
	December	73	7
1884.	January	58	4
	February	22	5
	March	45	3
	April	15	2
	May	37	3
	June	34	–
	July	40	6
	August	26	2
	September	18	1
	Total	478	48

Percentage of deaths to cases, 10.04 per cent.

No cases of small-pox are noted. It is conceded that the reports of cases of diphtheria and scarlet fever are pretty full, very few cases escaping notice.

The city government appropriated three thousand six hundred dollars for the uses of this Board for the fiscal year ending March 20th, 1885.

WAYNE TOWNSHIP. - *Report from* RICHARD J. BANTA, *Sec'y.*

The drainage of lands in the western part of the township is needed very badly, and the people begin to see the advantage they would derive from it. Some have already commenced, and I think others will follow.

SALEM COUNTY.

LOWER ALLOWAYS CREEK. *Report from* W. WINFIELD PATRICK.

Dysentery and malarial diseases have been prevalent, also measles and mumps.

The losses of animals have been small, and have had no contagious diseases.

LOWER PENNS NECK. - - *Report from* SAMUEL LECROY.

No disease of animals except a few cattle that have died in the meadows a few weeks ago.

We have had this year typhoid fever, some malaria, fever and ague.

QUINTON TOWNSHIP. - - - *Report from* G. A. AYARS.

Public health laws and regulations receive careful attention from Dr. A. G. McPherson, member of local Board of Health.

Sanitary expenses, total up to date, $16.

No special diseases, but all slightly tinctured with malaria.

CITY OF SALEM. - - *Report from* WILLIAM T. HILLIARD.

In presenting this our second annual report, we feel there is cause for congratulation that the health of our city has been generally good; no epidemic or contagious disease having prevailed to any considerable extent during the year.

As stated in our last report the public water-supply is from Laurel run. The works are owned and conducted by the city, the water being conveyed through cast-iron pipes a distance of three and a half or four miles. The quality of the water continues to be unsatisfactory, so that it is used for drinking and culinary purposes only to a very limited extent, except in winter. The water of the run when it enters the pond is pure and the quality good, but the bottom of the pond being swamp, mud or turf, causes a considerable discoloration of the water, and imparts to it a disagreeable taste. It has been introduced into about two hundred and five premises. The water of our wells, as previously mentioned, is quite hard, with a slightly unpleasant taste to those unaccustomed to it, but is believed to be entirely

wholesome. One of the ordinances which the Board have under consideration, restricts the placing of privies too near wells, though in most cases the depth of the lots has allowed of their being placed at a safe distance.

The excessive rains of last February and March caused many cellars to have water in them which had been exempt for more than twenty years, it being an unusual circumstance, since our streets were graded and the gutters paved, for our citizens to be thus inconvenienced. The bank meadows, which are contiguous to the city, are well drained, and malarial diseases have not, it is believed, been more frequent here than in other places. We have no public sewers, except two short ones to convey the gutter water across the street, and a short distance away. One of these claimed our attention during the summer, but has since been repaired and partially rebuilt under the direction of a committee of the city council.

As intimated above, the city is without any regular system of public sewers, but private sewers or drain pipes are in many cases used to convey the contents of indoor water-closets and kitchen slops to reservoirs or cesspools, which have heretofore been constructed in no particular or prescribed manner, and but very seldom with cemented bottom and sides. This is another subject concerning which an ordinance is now pending. It might be mentioned that the two creameries located in the city, where ice cream is largely manufactured, in order to avoid annoyance to the public, convey their waste-water in underground pipes a considerable distance.

The condition of the slaughter-houses, and what disposition to make of them, has claimed much of our attention, particularly during the summer months. The owners have exercised increased care in regard to them since this Board has had them under its supervision, but it seems to have become almost a positive fact that the health and comfort of those living in their neighborhood demand that they should be removed outside of the city limits. Some recommend their being located on the creek, so the blood and offal which are now consumed and manipulated by swine, might be discharged into it; but, it being a tide-water stream, the animal matter so emptied into it might, by the action of the tide, be prevented for some time from passing very far down the stream, and so become a cause of annoyance.

No new manufactories have been built which would be likely to

affect the public health. The four canning factories are all located near the creek, so their refuse can be discharged into it, which has been done with one exception, and in that case this Board have notified the owners of the necessity of making a change before another canning season.

We have had under our consideration a code of ordinances relating to the public health. Our city not being compactly built, and containing only between five and six thousand inhabitants, requires fewer ordinances of this character than larger and more populous cities; but we feel the importance of having certain regulations on this subject.

In our last report it was mentioned the board of chosen freeholders were considering the expediency of building a pest-house for the accommodation of persons afflicted with contagious diseases, but we regret to say the opposition to it was so great in some quarters, it was given up. Though we have had no cases of smallpox during the year, yet our past experience induces the belief that something of the kind would be very useful.

SOMERSET COUNTY.

BEDMINSTER TWP. *Report from* WM. P. SUTPHEN, M.D., *Sec'y.*

The Board of Health of Bedminster township are happy in saying that it has no especial matter to report. Whether from an especial favor from the Giver of all Good, or from reasons in which this Board may have been in part instrumental, we can say that we have passed through a year of unusual good health.

No contagious diseases have visited us, and malaria, though existing, has not assumed a general character, and has confined itself to places where it had cause to come. Prompt action by the physician of the Board (and our people are becoming more attentive), has had favorable results in almost every instance. The water-supply of the township is by wells and springs.

BERNARD TOWNSHIP. - *Report from* W. PENNINGTON, M.D.

Malaria exists two miles below, in the Morris county plains (alias Swamp), but has no effect on health of the villages, and only seems to occasion chills and kindred diseases there when the Passaic is low or after a heavy freshet.

Streets are kept clean, with the exception of some few individuals whose pleasure it is to heap their garbage in the public street, which seems to be only disagreeable to the eye and good taste, but not prejudicial to health.

The houses, for the most part, have cellars, which are used for vegetable storage. Houses are generally occupied by single families.

The public health laws are not kindly considered as of much account by the township officers. In fact, the only party who would endeavor to give you a statement of the township condition is my humble self.

We have had sporadic cases of diphtheria, pneumonia, rheumatism, typhoid fever, &c., but no epidemics.

BRIDGEWATER TOWNSHIP. - *Report from* WM. S. POTTER, *Sec'y.*

There has been no disease prevailing as an epidemic or endemic during the past year. A few sporadic cases of diphtheria only have occurred.

Slaughter-houses have claimed and received considerable attention from the Board. In one case the Board ordered the cessation of slaughtering, and compelled the party to remove to the suburbs. In other cases disinfectants were ordered used, and the parties compelled to keep them in a cleanly condition, so as not to be a nuisance, detrimental to health.

All nuisances of this character have been closely watched and immediately abated whenever they came to the knowledge of the Board. (This Board has recently printed a valuable circular for households, which can be had on application.)

HILLSBOROUGH TOWNSHIP. *Report from* W. H. MERRELL, M.D.

Slaughter-houses are managed fairly well.

Most of the cemeteries are by the church-yards. These have not been located with regard to sanitary principles.

The care over contagious diseases is in the physician's charge; vaccination likewise. This is neglected until there comes a case of varioloid, and then a rush comes.

Just now I am having under treatment a family of whom three of the four members are having typhoid fever. The entire water-supply is obtained from the cellar. Here is a spring of lasting water. The

water does not seem to be very bad, but in rainy times it overflows the entire cellar, and this is filled a foot or two for days and weeks. It has not been overflown now for four months, but there is a stench which salutes one boldly upon entering. The privy is up the elevation from the spring, but I have not learned that the water is contaminated. Further investigations will show.

SUSSEX COUNTY.

BYRAM TOWNSHIP. - - *Report from* JOSEPH MCMICKLE.

Drainage and sewerage on property in the village of Stanhope is not decided yet. At the last annual assessment of taxes for all purposes I was ordered to assess $1,000 for drainage and sewerage.

MONTAGUE TOWNSHIP. - *Report from* GEORGE N. COLE.

We have but one slaughter-house in our township, and our attention was called to it by some neighbors saying it was a nuisance. The Board met and made a thorough investigation of said house and examination of the grounds and surroundings, and came to the final conclusion that there was nothing there to constitute a nuisance. Therefore, the said Board proceeded to issue a permit to Peter D. Warner, a lessee, to continue the butchering business in the same place, for no specified time, the Board reserving the right to revoke said permit at any time when, in the judgment of the Board, there was anything to warrant their action.

In relation to vital statistics the reports have been regular from all the practicing physicians in our locality, as well as from other sources.

STILLWATER TOWNSHIP. - *Report from* C. V. MOORE, M.D.

Almost every house in the township has a cellar under it, in which vegetables are stored for the winter. The cellars of many houses are damp from springs, and in many cases water is conducted into cellars and collected in vats for cooling of milk and butter, the farmers thus rendering the rooms of the house damp and, in my judgment, rendering the house unhealthy. More than once, I am satisfied, cases of diphtheria have had their origin from this cause.

The water-supply of this township is mainly from wells and springs, and a few persons or families depend upon cistern-water for drinking purposes.

WALPACK TOWNSHIP. - - *Report from* FRANK BEERS.

A few instances were reported where it was necessary for our Board to recommend the removal of buildings which we believed would prove detrimental to health. In every case these instructions were complied with.

There is some malaria, confined mostly to the northern part of the township. No epidemics of any kind.

UNION COUNTY.

CRANFORD TOWNSHIP. - *Report from* EDWARD S. CRANE, *Sec'y.*

Township unusually healthy. The prevalent disease, diphtheria. Twenty cases seemed caused by use of addition to school-house two days after finishing plastering, of which only one case proved fatal up to date. One trustee of school being away, and the other two differing in opinion, the Board of Health ordered the school closed for one week, and the addition vacated for one month and thoroughly ventilated. Fires were kept in them day and night.

ELIZABETH CITY. - - - *Report from* A. R. REEVE.

Public water supplied from the sources of the Elizabeth river, principally surface-water and spring, by Elizabeth Water Company; quite a number of private wells, also.

There are thirty-seven miles of sewers, brick and pipe, which empty partly into the Newark bay and Staten Island sound, and partly into the Elizabeth river, the latter being, however, considered only a temporary outlet.

No contagious diseases except scarlet fever and diphtheria.

The only deaths of animals of importance was in the case of the horses of the Elizabeth Ice Company, in which stables over twenty-five horses were stricken with typhoid pneumonia within the month of October, eight of which proved fatal. The cause was believed to be a polluted well within the stable, and improper drainage.

No fire-guard or escape known in the city. Ten fire companies; six steamers, furnished with jumpers, tenders, &c.; two hook and ladder companies, &c.

Board of Health organized under the recent State laws, and a sanitary code adopted and enforced. Eight thousand dollars provided by city council.

FANWOOD TOWNSHIP. - *Report from* F. W. WESTCOTT.

I know of but one case of disease of animals, which was immediately reported to Trenton. It resulted in a loss of seventy-five hogs. I am happy to say that by care the disease did not spread, and has entirely disappeared.

Slaughter-houses have ceased to be a nuisance during the past year, being conducted in a cleanly manner.

Births, deaths and marriages are reported by those in charge, and in case of births when no physician is present the report is made by the assessor, due pains being taken to report every case.

Due care over contagious diseases is taken by the Board of Health, all cases being immediately reported first to local Boards, and then if necessary to the State Board.

We have no prevalent disease to report. The past year has been a remarkably healthy one. Especialy we are happy to report the decline of malaria. A very few cases, not sufficient to say prevalent, have been known in the township. Two or three cases of scarlet fever have been reported and these of a mild type, and we have very free from all kinds of bowel trouble. Vaccination has received due attention. A list of those unvaccinated is furnished the Board each year, and at this date only three are reported in our limits as unwilling to yield to vaccination.

LINDEN TOWNSHIP. - *Report from* JOHN A. ETHERIDGE.

The commissioners of the borough of Linden have organized a Board of Health for their district and have made some improvements in regard to drains, &c., and will endeavor to look after the health laws.

The health of Linden township has been good the past year. Some cases of malaria, but not as bad as past two years.

Altogether, our township is improving, and the inhabitants now find the benefits derived from the health laws.

CITY OF PLAINFIELD. - - *Report from* O. B. LEONARD.

The source of water-supply is exclusively from wells, either dug, driven or drilled. The quality of the water is excellently pure and in never-failing abundance. The average level of this subterranean supply is about sixteen feet below the general surface of the ground.

There is no established system of sewers, and the house refuse is discharged into private cesspools, built with open bottoms and loosely stoned sides. They are emptied at the discretion of the owners or tenants, and at very irregular intervals. Outdoor privy vaults are numerous, and do not get that careful attention which is necessary for the best sanitary condition of the localities in which they are situated.

SPRINGFIELD TOWNSHIP. - - *Report from* W. B. STILES.

Open ditches are mostly used. Some under-draining is being done on heavy clay soil. In the majority of cases it is possible to have dry cellars. There is a belt of low land of a swampy nature which ought to be reclaimed. This could be accomplished by lowering the bed of the river and then by ditching.

SUMMIT TOWNSHIP. - - *Report from* D. M. SMYTHE, *Sec'y.*

We are gradually correcting health abuses that may exist, more by persuasion than force, and our good work is both seen and appreciated.

WARREN COUNTY.

FRELINGHUYSEN TOWNSHIP. - *Report from* F. RORBACH, M.D.

The year ending with the 1st inst. has been characterized by a greater amount of sickness and mortality than for several previous years, owing, I think, to the singularly irregular atmospheric conditions. The mortality, however, has been mostly confined to the aged and chronic cases. The epidemic of scarlatina reported last year as prevalent during the spring and summer, continued until about December 1st, but the majority of the cases were of mild type, and out of the whole number (sixty-four) but three were fatal, one from the fever and two from albuminuria, &c. During the winter and spring, acute pneumonitis, pleuritis and pleuro-pneumonia prevailed to an unusual extent, but all yielded to treatment. Typhoid complications

were less frequent than usual. Sporadic cases of measles and röthelen were met with, but not any of diphtheria. The latter, as also malarial diseases, which up to three years ago were so prevalent here, have become comparatively infrequent, owing to greatly improved hygienic conditions. Commencing about the 1st of August and still continuing, though rapidly abating, we have been visited by an epidemic of gastro-intestinal diseases—cholera-infantum and entero-colitis in children, and cholera-morbus, enteritis and mild dysentery in adults.

During the past three or four years much improvement has been made in the surroundings of dwellings as to cleanliness, drainage, &c., so that malaria, diphtheria and typhoid diseases, once so rife, have become exceptional.

GREENWICH TOWNSHIP. - *Report from* WM. SHERRER, *Sec'y.*

Drink water from cisterns and springs and a few wells. The wells are mostly hard water. Our streams come from the mountain springs, the water used for watering stock. No sewage supply above source.

No drainage; cellars dry; no swamps; malarial fever prevalent.

Houses, without exception, have cellars, and largely used for storage of vegetables. Very seldom more than one family in a house.

Intermittent fever prevalent. No inquiry as to loss of animals nor as to contagious diseases.

Slaughter-houses not inspected.

HARMONY TOWNSHIP. - *Report from* J. D. DEWITT, M.D.

Vaccination is not properly attended to. Many families do it themselves, obtaining the lymph from neighbors, regardless of the hereditary tendencies. The trustees of the school districts do not require a scholar to be vaccinated as a condition of admittance.

Scarlet fever has prevailed, in a mild form, during the whole year. Many children remained out of school only a few days.

From April to July we had whooping-cough and measles prevailing; also we have had a few isolated cases of dysentery, typhoid and malarial fevers, and one death from typhoid fever.

Hog cholera has prevailed somewhat extensively.

KNOWLTON TOWNSHIP. - *Report from* MARSHALL COOL, *Sec'y.*

The general health of the township has been very good. In July there was a number of cases of dysentery in the village of Delaware.

The village is located in a valley, quite low. The inhabitants use, principally, well-water, heavy showers passing over that section of country flooding the surface of the valley and settling in the wells. This was supposed to make the water impure. This caused a greater number of cases of dysentery, of which several proved fatal. We had but two cases of typhoid fever prove fatal.

LOPATCONG TOWNSHIP. *Report from* JEREMIAH YEISLEY, *Sec'y.*

The general topography, drainage and other facts relating to the general outlines of the township have been given in former reports, and nothing new has happened relating to these facts. The water-supply is pure, and all sanitary arrangements are kept up to the required standard, and there has not been any complaint made to the Board on account of violations of the laws of health.

No prevalent diseases have occurred among the people of the township, and only one case which was remarkable, namely, the family of Patrick Kelegher, who lost four children by a disease called the bloody dysentery; otherwise the general health has been good, and the number of deaths have been twelve less than last year. There has been a disease prevalent among the hogs in the township, which I think has prevailed in the western part of the State. It has taken about one-third of the hog stock of the township, but the disease is now about abated.

OXFORD TOWNSHIP. *Report from* L. B. HOAGLAND, M.D., *Sec'y.*

Have had a few (perhaps fifteen or twenty) cases of diphtheria in a mild form, with one or two deaths. Malarial fever is at all times prevalent among us. In fact, almost every disease met with takes on the intermittent type.

POHATCONG TOWNSHIP. - *Report from* S. W. WIEDER, *Sec'y.*

The public health has been good. Malaria has been very limited the past season. People are generally careful about any decaying vegetables, or anything that will create any nuisance.

During the season I was called to inspect some calves, pronounced by a veterinarian to have pneumonia. Five died, but I think it must have been some other disease. About midsummer a disease started among the swine in the western portion of the township. It first

appearance in a field where hogs were put to pasture in stubbles and left there to get along the best they could. They did not have any fresh water, but drank from pools that stood on the ground. The disease still exists in Hunterdon and Warren counties. In this township the loss is from $2,500 to $3,000 this season, many farmers losing all their hogs. Those that have had the disease are worthless. Several farmers have killed and buried those that have had it. All known remedies have been of but little value.

WASHINGTON TOWNSHIP. - *Report from* F. M. COOK, M.D.

Cesspools are the usual termination of drainage-pipes, and are not, as a rule, cemented. As a general thing, an old barrel, sunken in the ground, or a hole filled with stones and covered with dirt, answers as the receptacle for all the kitchen drainage.

The houses have cellars, which are very often used for storing vegetables during the winter.

Hog cholera, for the last two months, has been epidemic.

This year has been remarkably healthy. During the early part of last spring scarlet fever prevailed in a very mild form, and, after that, an epidemic of measles.

REPORT OF THE COMMITTEE OF ANALYSTS TO THE STATE BOARD OF HEALTH.

INTRODUCTORY REPORT, BY PROF. ALBERT R. LEEDS, PH.D., CHAIRMAN.

Owing to the extremely restricted means which were placed at its disposal, this committee has been able to do but a small portion of the work which it could have done with great advantage to the public interest of the State and the health of its inhabitants. For, besides being charged with carrying into effect the provisions of the general law relating to the adulteration of food, drink and drugs, its time and energies have also been largely devoted to the inspection of kerosene and the restriction of the sale of dangerous oils throughout the State. With reference to certain articles of food, the committee has, as yet, done nothing. Most important of these articles is the air we breathe, which, on account of the development of manufacturing industries, accompanied by the production of vile and poisonous gases, has become, in many localities, polluted to such a degree as to render it offensive to the senses and dangerous to the health of the inhabitants therein. In England, where similar nuisances have arisen, the government has enforced their abatement by requiring the manufactories to be carried on under suitable sanitary restrictions.

WATER-SUPPLY.—Next in importance to air, as an article of food, is water. It is gratifying to record that in no State has a greater amount of attention been paid to this vital subject than in New Jersey. Suits instituted at common law in this State have resulted repeatedly in the verdict that persons that have polluted, by sewage and other ways, the waters of streams, have been guilty of maintaining a common nuisance, and that the right obtained by charter, usage or otherwise, of employing the water of a stream for

manufacturing or other uses, confers no right whatsoever, under the common law, to abuse it. The same intent is strongly manifest in certain specific legislation upon this point. The contrary doctrine, that rivers can, in any instance, be employed as sewers, if the convenience or profit of those living on their banks so dictate, is a doctrine so fraught with evils of untold magnitude, that no exertion should be spared to oppose it, both in writing and in action. The most notable instance of the good results thereby obtained, is that presented in the case of the lower Passaic river, which is used as the water-supply of both Newark and Jersey City. In September, 1881, the contamination of this stream became so alarming that the Newark Aqueduct Board and the Jersey City Board of Public Works appointed a joint Board of Pollution of the Passaic River and its Tributaries, whose business it should be to examine into and restrict this growing evil. As the result of the labors of this Board, every source of contamination has been diligently inquired into and a strict surveillance maintained. The co-operation of a large number of manufacturers, residents, and even of communities, sewering into the river, who were at first lukewarm or opposed, has been secured. At the time of writing, the fruit of these labors is shown by the much-improved and pure condition of the water. This statement being founded not upon opinion, but upon the evidence presented by the chemical analysis of the drinking-water of these two cities, such analysis having been made on the first of each month for several years past. The great obstacle to the completion of the work thus happily begun by the joint Board of Pollution, has hitherto been the sewage of the city of Newark, this being carried by the reflux movement of the tide up the Passaic river, beyond the intakes of the Jersey City pumping station. To obviate this difficulty, both cities endeavored to obtain the passage, by the Legislature, of a bill authorizing the construction of a tidal dam. But this bill failed of passage, on account of its possible injury to the navigation of the stream. A much better plan, however, has recently been adopted by the city of Newark, which is to construct a system of sewerage that will enable it, after draining from different quarters to a common reservoir at a lower level, to pump its sewage and carry it out into Newark bay, beyond the influence of the tide. This earnest on the part of the city of Newark to do all that lies within its power of taking care of its own sewage, will, no doubt, urge the committees farther up the river to put into execution suitable plans for doing

likewise. They have already the experience of more than a quarter of a century in England, and are able to adopt, without the costly experience of disastrous failures, methods which have been tried and proven successful, of disposing of the sewage of towns much larger than any situated on the Passaic above Newark. If these steps are taken there is no reason why the water-supplies of Jersey City and Newark, without abandoning their costly pumping stations, may not soon become again as clear, attractive and wholesome as the water-supplies of Brooklyn, Rochester and other favorite cities.

It is important, before leaving this subject, to note that disastrous troubles may arise in connection with the water-supplies of communities, entirely apart from sewage or any artificial contamination. During the course of the year just passed, the city of Hoboken has been afflicted in this manner. In the month of July its water-supply, drawn from the river Passaic in its upper portion, at a point where no sewage had entered it, suddenly became very unpleasant to taste and smell. Inquiry revealed the fact that the unpotable condition of the water was due entirely to natural causes: the vegetable and other organic matters carried into solution in the water during a prolonged period of summer drouth, being greater in quantity than could be satisfactorily disposed of by the regenerative agencies naturally at work in the waters of a flowing stream. On being pumped into the reservoir at Hoboken, an enormous development of oscillariæ and similar plant-growths which find a congenial habitat in nonaerated waters surcharged with vegetable matter, immediately took place. No time was lost in applying the remedy indicated by the nature of the difficulty, and the water was rendered, and has since remained, sparkling in appearance, and excellent, both as regards taste and smell.

Great assistance has been rendered during the past two years in the way of obtaining accurate statistics relating to the amount and distribution of potable water-supplies throughout the State, by the State Board of Water Commissioners. On the basis of the topographical surveys, executed by the State Geologist, this Board has prepared hydrographic maps, which have rarely been equalled in perfection and thoroughness of execution. These maps are intended to show the relations existing between the natural distribution of the State water-supply in its various hydrographic basins, to the artificial requirements of the water-supplies of the communities now and in the future,

possibly existant in these various basins. This much-needed work is the first of its kind, so far as I am aware, which has been executed within the United States. The example will be extensively copied, and will supply a solid foundation for the future scientific discussion of the vital problem of pure water-supply.

WELLS.—Allied to this work has been that of investigating the water-bearing strata in a number of places, to discover whether they are adequate to supply the needs of local communities. The results obtained have been of a most gratifying character, and will give a great impetus to inquiries of this nature, inasmuch as large communities, like that of Princeton and Brick Church, have thus obtained supplies of potable water far in excess of their present wants.

On the other hand, the last year has supplied additional testimony, already unhappily very large, of the morbific nature of the water in the surface wells located within city precincts or in contiguity to dwelling-houses in town and country. The inspectors of numerous Boards of Health have utilized the services of this committee by sending a large number of samples of well-water to be analyzed. In very many instances the analyses have demonstrated the poisonous character of the samples, and the wells have been accordingly closed by the orders of the local Boards. Of the many instances, one may be more particularly cited of a well located in the immediate vicinity of a cemetery, and which proved on analysis to be most dangerously polluted, and yet was being used by the children of an adjacent school-house. The Committee of Analysts regards the inspection and condemnation of contaminated surface wells as a work of pressing and vital importance. The inspectors of local Boards are requested to make a searching inquiry into all such suspected cases within their jurisdiction. In localities where local Boards exist, the cost of such analyses, which is but little greater than the actual expenses of conducting the same, should be paid by the local Boards. In other instances, the expenses will be defrayed out of the funds appropriated by the State for the enforcement of the general law relating to the adulteration of food. The cost to any local Board of such sanitary water-analysis is about ten dollars for a single analysis, and for a number of analyses performed at any one time such a reduced sum as will comport with the magnitude of the work and the extent of the services rendered.

Milk.—The good results attendant upon the enforcement of the "Act to prevent the adulteration and to regulate the sale of milk," are growing more and more apparent. In those cities where a violation of the provisions of this act has been followed by immediate prosecution and punishment at the hands of the proper officer of the law, the diminution in the amount of adulterated milk offered for sale has been very rapid; and out of a given number of samples inspected, the percentage of those which have been reported by the Inspector, and proven on analysis, to be adulterated, has diminished from month to month until, in some communities, the finding of a sample of adulterated milk has ceased to be a common occurrence. So far as the committee is aware, no sample of milk has been condemned or fine imposed, under the provisions the act, which was not justified by the amplest and most convincing proof of the fact of adulteration. The more analyses are multiplied in this and in neighboring States, the more convincingly has it been demonstrated that the standard of twelve per cent. for the total solids in milk is a just one, and one which inclines towards leniency rather than the reverse, favoring the producer rather than the consumer, and making a most ample allowance for every possible variation properly due to the influence of season, feeding and breed upon healthy cows. To debase this standard below twelve per cent. would be to legalize the traffic in watered milk. Happily these views, in consequence of the beneficial operation of the law, are upheld in most portions of the State, and in those in which a prejudice against the milk law still exists, signs of the growth of a more favorable sentiment are becoming apparent.

The importance of this subject becomes still more apparent in relation to the vital problem of artificial infant feeding. In the report of the State Board of Health for 1882, the results of an inquiry into the nature of and results obtained by all the various articles of infant food at that time in the market, is given at length. The final conclusion arrived at was, that no artificial food could obviate the necessity for the use of cow's milk as being the most available, and practically the best substitute for woman's milk in the nutrition of infants. Subsequent research has confirmed the justice of the proposition therein maintained. A very extended inquiry and comparison with other methods has shown that Ritthausen's method, an outline of which is detailed in the report for 1883, is a rigidly accurate one for the analysis of milk, and this method was followed in the comparative

analysis of a large number of samples of cow's and woman's milk. The most important result is contained in the following table:

ANALYSES OF EIGHTY SAMPLES OF WOMAN'S MILK.

	Average.	Minimum.	Maximum.
I. Specific gravity	1.0313	1.026	1.0353
II. Albuminoids	1.995	0.85	4.86
III. Sugar	6.936	5.40	7.92
IV. Fat	4.131	2.11	6.89
V. Solids not fat	9.137	6.57	12.09
VI. Ash	0.201	0.13	0.37
VII. Total solids (by addition of constituents)	13.268	10.92	16.79
VIII. Total solids (directly by evaporation)	13.267	10.91	16.66
IX. Difference between VII. and VIII.	0.001	0.00	0.21
X. Water	86.732	83.21	89.08

This extended series of eighty analyses confirm the statements made in the earlier report (that on infant foods), that the albuminoids are the most variable constituent of woman's milk, while the fat is next most variable, and the sugar the least. But they likewise show that *the average amount of albuminoids* in woman's milk may be regarded without sensible error, as *two per cent.*

The practical outcome and object of these researches has been to establish the relation existing between the constituents of cow's and human milk, both as their percentage composition and as to their physiological nature and value in infant nutrition. This being established, it becomes possible for the physician to write out a prescription and formula whereby the composition of cow's milk may be so modified that it becomes in composition and properties a substitute for human milk, and whereby it may be used as such in the feeding of infants. Evidently, however, in order that this prescription may be of value, it is necessary that the cow's milk shall not have been tampered with before being brought into market, but that it shall represent what the prescription calls for, which is whole milk.

BUTTER AND OLEOMARGARINE.—As preliminary to the inspection and condemnation of substitutes for butter, sold otherwise than under their real names, the methods of analysis of these articles have received careful study by the committee, and a very valuable inquiry into these

methods has been made by Professor Cornwall, and will be found later on in the report. It is gratifying to learn that the detection of adulterations of butter has reached the stage of precision and certainty, so that when steps are taken to restrict the illicit sale of such sophisticated articles, the analyst will not be hampered by the raising of doubts as to the validity of the proof presented by him in court.

KEROSENE.—The influence of the repressive legislation against the sale of dangerous illuminating oils has been very great, and in those portions of the State where regular inspection has been maintained, has resulted in driving those grades of kerosene flashing notably below 100° Fahrenheit, the standard prescribed by law, out of the market. When the law regulating the sale of illuminating oils went into effect in July, 1883, the retail dealers in Essex and Hudson counties generally sold two qualities of oil—the "amber oil," having a flashing-point varying from 85° to 92°, and the "white or astral oil," having a flashing-point varying from 96° to 102°. During the past year, in which I have had the assistance of Inspector Dr. T. B. Stillman, 130 samples of kerosene have been inspected and tested in these counties. Of these, 40 were amber and 90 white oil. The flashing-point of the former varied between 88° and 94°, with an average of about 92°. Of the 90 samples of white oil, 10 were over 100° flash-test, the highest being 106°, and the others varying between 101° and 102°. Sixty samples of the white oil fell just below 100°, their flash tests averaging 99°. These sixty samples had been bought by the retail dealers as being in most cases 103° flash-test, and were supposed by them to be in accordance with the provisions of the law. Twenty samples of white oil flashed between 94° and 98°, with an average flash-test of 96.5°.

Of the amber oil, 40 samples were inspected, flashing between 88° and 94°. But, as remarked above, this grade of oil has ceased to be sold where the retailer has been notified of the provisions of the law, and is now seldom met with except in localities where as yet a system of inspection has not been instituted. By inspection of such kerosene as was not sold under the name of "head-light oil," Mr. Wallace obtained 20 samples, all of which flashed between 90° and 95°. Seven samples of kerosene sent to Dr. Newton to be tested, proved to be in conformity with the State standard. The latter gentleman calls attention in his report to the dangers attendant upon the use of gaso-

line and naphtha in stoves for cooking purposes. As yet the only safeguard against these dangers is, that the law provides that gasoline and naphtha can only be sold in cans or vessels marked "not for inside light."

Apart from these statistics, however, the good results of the inspection of kerosene are evident in the greatly diminished number of accidents now, as compared with those previously. Happily such accidents are at present comparatively rare.

FOODS.—The Committee of Analysts in previous reports have called attention to the nature and amount of adulteration in many articles of food. In certain cases this information has been rendered more specific by means of laboratory investigation during the course of the past year, and will serve as a basis for future practical action. The general diffusion throughout the State of the facts made known in previous reports, and the growing opinion in favor of the proper enforcement of the law concerning the "Adulteration of Food, Drink and Drugs," are inciting the inspectors of the various local Boards to institute legal proceedings in regard to certain articles of food, and there is every prospect of an encouraging advance during the coming year in this direction also.

METHODS OF BUTTER ANALYSIS.

BY PROF. H. B. CORNWALL.

The preparation of the following paper was begun at the request of Dr. William K. Newton, State Inspector of Milk in New Jersey, and continued for the present report of the State Board of Health. Its object is not to present an exhaustive essay on butter analysis in general, but rather to treat of the methods commonly employed for determining the nature of the fat in commercial butters, genuine as well as artificial.

The general subject of butter analysis has very lately been so admirably and comprehensively discussed by Prof. G. C. Caldwell, (*Second Annual Report of the State Board of Health of New York*, 1882,) that a new paper on the subject would be superfluous, but several points of great importance with reference to the chemical analysis of butter fat have been published during the last two years. These, together with some of the writer's own results, will be presented in this paper.

It may be well to present a very brief statement of some of the best rapid methods for a general examination of butter before discussing the special questions already mentioned.

Genuine butter from cow's milk commonly contains from 82 to 90 per cent. of true butter fat, together with water, curd (casein), salts and a very little milk sugar, which are contained in the buttermilk that remains with the butter after it is worked. Usually some common salt is also added to butter, and occasionally a little saltpetre and sugar to preserve it better. The natural, more or less yellow color of butter, varies with the nature of the cow's food, and no objection need be made to the use of various harmless coloring matters to heighten the yellow tint; the use of objectionable additions, like chrome yellow and aniline derivatives, although rare, is

said to have been practiced. Genuine butter often loses its yellow color on exposure, showing white streaks and spots, which, to the inexperienced, may appear as very suspicious indications. It also, unless carefully freed from buttermilk by thorough working, is very liable to become rancid, owing to decomposition of the glycerides of the volatile acids present, especially butyric acid. Artificial butter contains usually little or no butyric acid and, therefore, seldom becomes rancid. No mistake is commoner than the condemning of real butter as a false article on account of this very rancidity, the absence of which, in old butters at least, is rather to be taken as a suspicious sign.

Butter is commonly adulterated in two ways: by the addition of various make-weights, such as water, excess of salt, farinaceous substances, chalk, soapstone and similar materials; and also by the addition of various foreign fats. Some of the butter now sold contains no true butter fat.

Of the first class of adulterants, little need here be said. Their detection is a very simple matter. The mere appearance of the butter, its behavior in the mouth, and a microscopical examination of it, will ordinarily quickly reveal the presence of solid, non-fatty adulterants.

For a rapid estimate of the quantity of non-fatty substances in butter, Hoorn's method may be adopted. It was followed by Caldwell (*op. cit.*), and is thus described by him:

"Hoorn, (*Fresenius' Zeitschrift*, 11, 1872, 334,) in a graduated tube with a narrower graduated part at the lower end, melted 10 grams of butter and mixed it with 30 cc. of petroleum ether by shaking; calling a cubic centimetre of these matters 1 gram, he found, usually, 12 to 14 per cent. in good butter, and over 20 per cent. only in adulterated butter; the result is more reliable if the first ethereal solution is decanted off and the residue is shaken up with a fresh quantity of the ether. All other adulterations that are not fatty will remain with the water."

Caldwell applied Hoorn's test as follows: "About 10 grams of the butter were put in a tube graduated to tenths of cubic centimetres and melted by immersing the tube in warm water; the volume of the melted butter was then noted, the petroleum ether added, and after corking the tube the solution of the fat was effected by vigorous shaking; then, after standing three or four hours, the volume of the matters

not fat, collected at the lower end of the tube, was noted and the per cent. by volume calculated."

By this method, he found as a minimum percentage of non-fatty matters in various butters, genuine and artificial, 7.74; and as a maximum, 30.75, the lower figures being generally yielded by the artificial butters.

If it is desired to determine more accurately the proximate constituents of a butter, the following method may be adopted:

One or two grams of the butter are heated in a shallow dish in an air-bath, at 100° C. (212° Fahr.), until it ceases to lose weight. The loss of weight is water, which should not exceed 20 per cent., although more than twice this proportion has been fraudulently incorporated with butter by processes known to the initiated. The dried butter is then treated with hot ether, which dissolves only the fat. The ether solution may be decanted into a weighed vessel (or passed through a dry, weighed filter, if necessary,) and the treatment with ether repeated until the fat is completely extracted. The ether solution is evaporated and the fat dried and weighed as before. Its weight ought to be not less than 80 per cent. of the weight of butter taken. The residue left undissolved by the ether is also dried and weighed.

A qualitative examination of the non-fatty residue may be made by washing out all soluble matter with water, digesting the remainder with ammonia to remove the casein, and testing the final residue for starch with tincture of iodine; and for mineral matters, chalk, gypsum, soapstone, barytes, etc., by well-known chemical tests.

Any considerable addition of mineral matters to butter may be detected by igniting a gram or two of the butter and weighing the ash. This does not usually exceed two or three per cent., and, according to Blyth, (*Foods, their Composition and Analysis*, 1882,) should not, in the opinion of most chemists, exceed 8 per cent.

Borax or alum, which, according to Dietzsch, (*Nahrungsmittel und Getränke*, 1884,) have been used to facilitate the incorporation of excess of water with butter, should be sought for in the water solution from washing the non-fatty residue just mentioned. The details of the tests need not be given.

The second class of adulterants, foreign fats, furnishes, without doubt, the most general means of adulterating butter at present; of these fats, oleomargarine is the best known. Originally, oleomargarine was made from animal fats, but now vegetable oils also enter into its

composition, or into the artificial butters made from oleomargarine. Lard, cotton-seed oil, benne oil, olive oil, rape-seed oil, and other vegetable oils also enter into the mixtures sold under the names of oleomargarine, butterine, lardine, etc., etc. The writer has been informed by one of his colleagues that cocoanut oil is also used in this country, while Dietzsch states that it is used in making "Schmalz-butter."

To Hehner and Angell belongs the credit of devising the first reliable method for the chemical analysis of butter fat. The method depends upon the fact that pure butter fat contains not only glycerides of the insoluble fatty acids, oleic, palmetic and stearic, but also a considerable proportion of the glycerides of certain fatty acids more or less soluble in water, especially butyric acid, which is readily soluble.

The following table from Blyth's *Foods, their Composition and Analysis*, London, 1882, shows the apparent general composition of butter fat:

GLYCERIDES EQUAL TO FATTY ACIDS.

Olein	42.21	=	Oleic acid	40.40	
Stearin and Palmitin,	50.00	=	Stearic and Palmitic acids,	47.50	
				87.90	Total insoluble acids.
Butyrin	7.69	=	Butyric acids	6.72	
Caproin, Caprylin and Rutin,	.10	=	Caproic, Caprylic and Rutic acids,	?	
	100.00			94.62	Total acids, calculating soluble as butyric.

Other animal fats, which are ordinarily used for adulterating or imitating butter, contain only the glycerides of the insoluble fatty acids, oleic, stearic and palmitic, the theoretical yield of which, as obtained by saponifying the fat and decomposing the soap with an acid, may be placed at 95.5 per cent. of the weight of the fat. Further investigation has shown that the percentage of insoluble fatty acids obtained from some of the commonest vegetable oils is very nearly the same, as in the table below:

Rape-seed oil	95.00
Poppy oil	95.38
Palm oil	95.60
Benne oil	95.60
Olive oil	94.08
Almond oil	94.02

The foregoing figures are taken partly from Wagner's *Jahresbericht*, 1879, 951, and partly from *Archiv der Pharmacie*, IX., 1878, 134.

Cocoanut oil contains, on the other hand, besides the glycerides of palmitic, myristic and lauric acids, a considerable proportion of the glycerides of caproic, caprylic and capric (rutic) acids, which are all more or less soluble in water; caproic acid dissolving with moderate ease in cold water, while caprylic is soluble in 400 parts of boiling water, and capric acid is but very sparingly soluble in boiling water. Consequently, when cocoanut oil is saponified, and the soap decomposed with an acid, the above slightly soluble acids are but slowly washed out from the insoluble ones, even with boiling water. They likewise distill over very slowly when the decomposed soap solution is boiled.

A large number of tests, chemical, physical and microscopical, have been proposed for the examination of butter. While several of these are more or less useful as accessory tests, none of them is capable of supplying a definite solution of the problem.

The specific gravity test is the most important of the physical tests. It has been largely used as a confirmatory test, for which it is generally well suited, and Dietzsch (*op. cit.*) prefers it to all chemical or other tests. He regards any butter having a specific gravity of 0.865 or less, at 100° C. (212° Fahr.), as adulterated. Blyth regards a specific gravity of less than 0.911 at 37.7° C. (100° Fahr.) as strongly indicative of foreign fat. This test, however, has lost much of its value since Muter has described (*Analyst*, VII., 93,) what he considers a cotton-seed oil product, cotton "stearine," having a specific gravity of 0.9115 to 0.912 at 100° F., which, added to artificial butter, not only gives it a better appearance in winter, but increases its specific gravity.

The only methods accepted as at all reliable for examining butter fats depend either upon the more or less thorough quantitative determination of the fatty acids obtainable by decomposition of the fat, or on allied operations.

Three of these methods, which have found extended use, have been tried by the writer: Hehner's, as well as a modification of it described by Blyth; Reichert's, and Koettstorfer's. Another method, in actual use by some analysts, proposed by West-Knights, (*Analyist*, V., p. 155,) the writer had not time to try. It depends upon the difference in solubility between the oleate, stearate and palmitate of barium or calcium, and the corresponding salts of the more or less soluble fatty

acids. It is probably open to the same objections which the writer finds against Hehner's process.

Hehner's process (*Zeitschrift für Analytische Chemie*, 1877, p. 145,) consists, as is well known, in saponifying the butter with alcohol and caustic potash, by the aid of heat; expelling the excess of alcohol by evaporation; dissolving the resulting soap in water; decomposing the soap by addition of dilute hydrochloric or sulphuric acid; collecting the insoluble fatty acids on a weighed filter; washing them with hot water until all the soluble (volatile) acids are removed; drying the insoluble acids and weighing them. The details of the method need not be given, but one of them will here be dwelt upon. Hehner states that the washing is to be continued until the filtrate shows no acid reaction, with sensitive litmus solution, and that 3 grains of fat will ordinarily require three-quarters litre of boiling water. This is probably true, but several writers have stated that they found butters requiring more water. Fleischmann and Vieth (*Fresenius Zeitschrift*, 1878, p. 287,) sometimes used 2 litres of water, and state that, even after using more than 2 litres, a very feeble reaction still remained. They finally adopted the plan of washing until 5 cc. of the wash-water showed no diminution of the exceedingly feeble acid reaction with a few drops of litmus solution.

A. Hanssen (*Inaugural-Dissertation*, Erlangen, 1882,) found difficulty, also, in determining how long the washing should be continued. He finally decided to use, at the most, from 2 to 3 litres of water for 2 to 2.5 grams of fat, and to use always a constant quantity of water, as the surest means of avoiding error, either by leaving a notable quantity of soluble fatty acids with the insoluble, or by a possible decomposition of the insoluble acids.

As regards the percentage of insoluble fatty acids in butter, Hehner states that it is usually between 86.5 and 87.5, and he sets the highest limit at 88. These figures will certainly be found true in the great majority of cases, but many instances have been published of pure butter giving higher percentages. Fleischmann and Vieth (*loc. cit.*) found 85.79 as the lowest limit, and 89.73 as the highest, in the examination of a large number of butters, and admit that, in the rarest cases, pure butter may yield 89.8 per cent., so that they set the limit at 90, while admitting the general applicability of Hehner's figures. They distinctly state that a butter, which on imperfect washing yielded 90.06 to 90.47 per cent. of insoluble acids, yielded when

when washed with quantities of water varying from 1,100 to 1,350 cc. fatty acid, from 88.88 to 88.31 per cent. Another butter, which had yielded with imperfect washing from 91.03 to 91.17 per cent., yielded on longer washing 89.73. It was on account of this last butter that they fixed the highest limit at 89.8, and everything in their article points to the conclusion that in their later experiments they were satisfied that they had washed thoroughly enough.

Fleischmann and Vieth further quote from the *Journal of the Royal Agricultural Society* (England), 1877, to the effect that Bell, director of the Somerset House Laboratory, in examining fifty butters as to their percentages of insoluble fatty acids, had found the limits to vary between 85.5 and 89.8.

Kretzschmar (*Berichte d. d. chem. Gesellschaft*, 10, 2091,) in the laboratory of the agricultural experiment station at Bonn, found several pure butters yielding over 89 per cent. of insoluble fatty acids by Hehner's method, and thought the highest limit should be raised to 90 per cent., while indorsing the method in general. Kuleschoff, (Wagner's *Jahresbericht*, 1878, p. 999,) obtained as much as 89.72 per cent. Jehn (*Archiv der Pharmacie*, IX., 1878, 335,) found 89 or more per cent. of insoluble fatty acids in three out of ten butters that he examined. It is true that he deviated sometimes from Hehner's method by collecting the insoluble acids in wax, and that all of these higher figures were obtained in cases where he used wax; but it is equally true that in one of these cases he found 89 per cent. when using wax, and 88.8 without it; and, also, that in four cases where he did use wax his figures varied from 86.6 to 87.5, so that the high figures are not with certainty to be ascribed to the use of the wax. De la Source (Wagner's *Jahresbericht*, 1882, 929,) found, in two tests of butters from cows fed with oil cake, 89.1 and 89.4 per cent. of insoluble acids, and objects to the French standard of 88 per cent. as too low. In the *Analyst*, IV., 197, it is admitted that genuine butter, when old and at certain seasons, may contain nearly 89 per cent. of insoluble acids, in which case it will also contain less soluble acids.

It seems to be reasonably certain that a butter ought not to be absolutely condemned unless the insoluble fatty acids obtained by Hehner's process reach 90 per cent., or very nearly that limit. If this be so, then, as Fleischmann and Vieth show (*loc. cit.*), it might very rarely happen that a butter could be adulterated with 50 per cent. of many foreign fats and yet escape detection; although, accepting

Hehner's limit as more common, the amount of adulteration could not exceed about 25 per cent.

R. W. Moore, however, states (*Chemical News*, December 5th, 1884,) that he has found cocoanut oil to yield only 86.43 per cent. of insoluble fatty acids by Hehner's process, and the experiments of the writer tend to confirm his statement. One experiment, conducted according to Hehner's process, was interrupted by accident, and lack of time before this paper had to leave the writer's hands, has prevented a repetition of it. It was carried far enough to show, however, that after the insoluble acids from 4.158 grains of cocoanut oil had been washed with 1 litre of hot water, there still remained enough soluble acids to require for each successive 100 cc. of wash-water the following quantities of one-tenth normal alkali: for the first 100 cc., 0.95 cc. of the alkali solution; for the second, 0.9; for the third, 0.95; for the fourth, 0.8. Manifestly, the soluble fatty acids were but slowly removed. These figures, calculated as butyric acid, represent nearly 0.2 per cent. of the weight of the cocoanut oil taken for each 100 cc. of wash-water.

A second experiment was instituted according to a modification of Hehner's method, described by Blyth (*op. cit.*) The fat is saponified in a closed flask with a definite quantity of alcoholic potash solution of known strength, and after expelling the alcohol the soap is transferred to a 500 cc. flask and decomposed with dilute sulphuric acid of known strength. The fatty acids are then melted and washed in the flask by successive additions of hot water, the wash-water being each time drawn off from the flask after allowing the fatty acids to become solid by cooling. The wash-water is passed through a filter, the insoluble acids being retained in the flask, and, finally, after sufficient washing, the flask, containing a little warm water, is adapted to an upright Liebig's condenser and boiled, or connected in the usual way with a Liebig, which has as a receiver a flask furnished with a mercury valve to form a closed system. After five or ten minutes' boiling, the distillate is added to the filtrates and the liquid in the flask run off from the fatty acids when cool. To these acids is added the ethereal solution of any insoluble acids adhering to the filter, and the whole is dried and weighed. The soluble acids in the combined wash-waters are titrated with one-tenth normal alkali, each cc. equal to 0.0088 of butyric acid. Blyth says that the wash-water will amount to from 600 to 700 cc. without calling attention in any way

to the necessity of ascertaining that the last wash-water is really free from soluble acids. If logically carried out, testing the wash-water as to acidity, this method may become extremely tedious, and, applied to cocoanut oil, would give the same percentage of insoluble fatty acids as Hehner's original method. If the washing is really to be stopped at 600 to 700 cc., the method becomes an arbitrary one and could not stand in a legal case. It is, moreover, in the writer's opinion, a mistake to allow the wash-water to become cold before it is removed from the insoluble fatty acids. An expert defense counsel might make very plausible objection to such a method of washing.

The method was, however, tested by the writer, limiting his wash-water to 1,050 cc.; the last five wash-waters, 100 cc. each, requiring respectively, 1.1, 0.9, 1, 0.85, and 1 cc. of one-tenth normal alkali for neutralization. It was plain that the soluble fatty acids were regularly being extracted at the rate of about 0.2 per cent. of the weight of the cocoanut oil taken (4.46 grams) by each 100 cc. of wash-water, but the washing was purposely stopped at this stage. Even with this imperfect washing the insoluble fatty acids corresponded, when dry, to 89.70 per cent. of the oil taken, while the soluble acids amounted to 3.44 per cent. The low total, 93.14 per cent., is easily accounted for by the persistent loss of weight of the impure insoluble acids in drying on the water-bath. They were losing a part of the soluble (volatile) acids and constant weight was not to be obtained. Another litre of wash-water would have brought the cocoanut oil nicely within the generally accepted limits for pure butter fat. As it was, it would have passed for three-fourths pure butter. The cocoanut oil, as purified by the writer, was bland in taste and almost absolutely odorless, and the writer has been informed by a colleague that cocoanut oil is used in making some artificial butters in this country. Moreover, Jeserich and Meinert (Wagner's *Jahresbericht*, 1882, 932,) have patented in Germany a process for rendering vegetable oils, cocoanut oil, palm-nut oil, etc., edible and suitable for making artificial butter by treatment with superheated steam, followed by saponification with one-quarter per cent. of calcined magnesia to remove any free fatty acids. After long stirring and careful washing they claim that a perfectly odorless fat, not rancid, is thus obtained. This claim appears to the writer a probably just one, and the possibility that cocoanut oil may indeed enter into the composition of artificial butters cannot be denied. In any event, Hehner's process,

pure and simple, must be held incapable of distinguishing cocoanut oil in mixtures, if not alone, from true butter fat.

Koettstorfer (Fresenius' *Zeitschrift*, 1879, 199,) devised a process for testing butter fat. Since, as already stated, genuine butter contains a comparatively large percentage of glycerides of the more or less soluble fatty acids (especially butyric), all of which have a lower molecular weight than the insoluble fatty acids, it follows that pure butter fat will require a smaller proportion of alkali for its saponification than fats consisting wholly or almost wholly of glycerides of the insoluble acids. Koettstorfer saponifies from 1 to 2 grams of the filtered fat in a narrow beaker of about 70 cc. capacity, covered with a watch-glass, by heating to gentle boiling, at first with stirring, for 15 minutes on a water-bath, with 25 cc. of a solution of caustic potash in highly-rectified alcohol, the solution being of known strength and about one-half normal. The watch-glass is then rinsed into the beaker with alcohol and the excess of potash titrated with one-half normal hydrochloric acid, phenolphthalein being used as an indicator. Two drops of a solution of 1 part of phenolphthalein in 30 parts of alcohol (90 per cent. by volume) is a suitable addition. The litre of the alcoholic potash is liable to vary slightly; hence 25 cc. of it should, from time to time, be tested by boiling as above, without any addition of fat.

Koettstorfer found that 1 gram of pure butter fat required from 221.4 to 232.4 (average 227) milligrams of KHO for saponification. For various other fats he found the following figures: beef tallow, 196.5; lard, 195.5; oleomargarine, 195.5; mutton suet, 197; olive oil, 191.8; rape-seed oil, 178.7. Assuming 227 as the mean for butter fat and 195.5 for lard and oleomargarine, he gave the following formula for determining the percentage of foreign fats in a butter: n representing the milligrams of KHO used for 1 gram of the fat: $(227-195.5) : (227-n) :: 100 : x$. He found that rancid butter required 1.5 to 1.4 milligrams less KHO than when fresh.

The process has found much favor, since a very large number of animal and vegetable fats were found to give, always, figures far below those obtained with true butter fat. A considerable number of such fats have been tested by Valenta (Wagner's *Jahresbericht*, 1883, p. 1152,) and by Allen, (*Ibid.*, p. 1157,) also by Moore (*loc. cit.*). All of these experimenters found that cocoanut oil yielded figures far above those given by butter fat, Moore obtaining from a good refined oil, before and after thorough washing with hot water, 250.3 and 246.2

milligrams of KHO, respectively, for 1 gram of oil. As Moore states, it is possible to mix oleomargarine with cocoanut oil so as to bring the results within Koettstorfer's limits for pure butter. To prove this, he calculated from results of his own tests, the quantities of a certain oleomargarine and the cocoanut oil which should be mixed in order to approach closely to Koettstorfer's two extremes, and the following is one of his results:

Cocoanut Oil (Washed).	Oleomargarine.	Milligr. KHO per grm.
53.1 p. c.	46.9	223.6
75.9 p. c.	24.1	234.9

The oleomargarine alone required 193.5 milligr. KHO.

Relying on Koettstorffer's test alone, no chemist could be certain that he was not certifying to the genuineness of a butter which was really free from any true butter fat.

Reichert (Fresenius' *Zeitschrift*, 1879, 68,) acting on the principle that underlies the Hehner method, modified the process so as to estimate a portion only of the soluble fatty acids, taking advantage of the fact that where an aqueous solution of a saponified butter fat is decomposed by an acid and boiled, the greater part of the soluble fatty acids can be distilled over with comparative rapidity and in reasonably constant quantity.

The fat to be tested is melted, best on a water-bath, any water or other foreign substances allowed to settle and the fat filtered through good filter-paper or cotton. If not perfectly clear it must be filtered again. Then 2.5 grams of the liquid fat are weighed in a flask of about 150 cc. capacity (Erlenmeyer's form is best), 1 gram of solid caustic potash and 20 cc. of 80 per cent. alcohol are added, and the whole heated to gentle ebullition on a water-bath, with frequent agitation, until the resulting soap is absolutely free from alcohol. The writer continues the heating until the air sucked out of the flask has no taste of alcohol; the flask being heated at the last, when danger of frothing is over, by placing it within the water-bath, so that it may be surrounded by steam. The removal of all the alcohol is essential. Afterwards 50 cc. of water is added to dissolve the soap, and when completely dissolved the soap is decomposed with 20 cc. of dilute sulphuric acid (1 of pure, strong acid to 10 of water), which is poured into the flask. The latter is then connected with a small, but efficient, Liebig's condenser, and the contents heated to moderate boiling, with

addition (as proposed by Caldwell) of two or three bits of pumice stone attached to platinum wire spirals, to prevent bumping. (Reichert proposed to prevent bumping by a current of air, which is unnecessary.) A bulb tube, or other contrivance to prevent mechanical carrying over of sulphuric acid, is advisable; but it should not be such as to cause undue condensation of the steam. The writer simply uses a moderately wide tube, ground slanting at the lower end, and reaching about 3 inches above the flask before it bends. The distillate, which contains some insoluble acids, and, in case of foreign fats, much, as it drops from the condenser, must be passed through a small, wet filter into a 50 cc. graduated flask, and as soon as 10 to 20 cc. has come over it is returned to the first flask. The distillation is then continued until 50 cc. has come over, which is at once titrated with one-tenth normal alkali solution. Reichert used one-tenth normal soda, with litmus solution (4 drops) as an indicator. The titration is ended when the blue color of the litmus remains permanent for some time.

As regards the execution of the above test, the writer finds that it is not necessary to weigh the solid potash with extreme care (differences of a centigramme are immaterial), nor to observe unnecessary caution as to the strength of the alcohol; but the method is strictly a comparative one and must not be arbitrarily altered. The writer has not made many duplicate determinations, but the few he has made have been exceedingly satisfactory. He also found that the result was not materially affected by using an inverted condenser during the saponification, to prevent possible loss by escape of butyric ether. Very great differences may result, however, if the sulphuric acid is added before the soap is dissolved.

The potash used for saponification should be practically free from chlorides and nitrates. Both it and the alcohol should be subjected to a blank test.

Reichert in his paper admits that his test needs further trial, and invites the same. From his own results he concluded that the distillate from pure butter would require an average of 14 cc. of one-tenth normal alkali, and never less than 12.5. He also found for:

Oleomargine	0.95 cc.
Rape-seed oil	0.25 "
Kidney fat	0.25 "
Lard	0.30 "
Cocoanut oil	3.70 "
Commercial butter	10.50 "

His formula for determining the percentage of butter fat in mixed fats is $B = 7.3 (n - 0.3)$; n being the number of cubic centimeters of one-tenth normal alkali used in titration. Adopting his conclusions, the method would be capable of detecting 10 per cent., or any more, of foreign fat.

Meissl (Dingler's *Polytechn. Journal*, 1879, 229,) modified Reichert's process by employing twice as much fat and potash, with 50 cc. of 70 per cent. alcohol, and decomposing the soap with 40 cc. of the dilute sulphuric. He distilled until 110 cc. had passed over, and then titrated with one-tenth normal potash solution. He obtained a range, in the case of 49 pure butters, of from 27 to 31.8 cc., corresponding to 13.5 to 15.9 according to Reichert's method. Meissl's modifications were devised to guard against loss by volatilization of butyric ether and to secure greater accuracy in titration. They have been adopted by some chemists, but they appear to the writer to be cumbersome and unnecessary, although not affecting the result materially. Ambühl (Wagner's *Jahresbericht*, 1881, 839,) used 14.05 to 15.55 of one-tenth normal alkali for 2.5 grams of fat; Medicus and Scherer (Fresenius' *Zeitschrift*, 1880, 159,) recommend Reichert's process, but find that the more fusible part of genuine butter, separated from the rest by partial cooling, may yield higher figures, viz.: 17.3 cc., instead of 14 cc. yielded by a well-mixed butter on which the experiment was tried. (Meissl made a similar observation.) They obtained for butters, from 13.6 to 14; for lard, 0.2; for rape-seed oil, 0.3; for benne oil, 0.35; for olive oil, 0.3; for palm oil, 0.5.

Seudtner (Wagner's *Jahresbericht*, 1883, 979,) following Meissl's method, obtained from a large number of butters, made at all times of the year, figures ranging from 24.25 to 32.25; his lowest results were obtained in February and July. He recommends that the lowest limit be placed at 24 cc. (12 cc. by Reichert's method), but would not, without further investigation, condemn a butter requiring 23 to 23.5 cc. (11.5 to 11.75 Reichert). His experiments were made on butters produced near the Tegren See and Starnberg See, also near Pasing.

Reichert's method is rational and convenient. It was selected by Caldwell in preparing his report (*op. cit.*), and yielded him the figures 14.1 and 13.9 in the case of two genuine butters. He says it "was followed with much satisfaction."

The writer has obtained with it the following results; the genuine butters were known to be such, the oleomargarine butters were bought

as such. The table gives also the results, in most cases, by Koettstorfer's method, and occasionally by Hehner's:

	Reichert. cc. one-tenth normal alkali for 2.5 grm. fat.	Koettstorfer. Milligr. KHO for 1 grm. fat.	Hehner. p.c. insoluble fatty acids.
1. Genuine butter,	14.5	228.2	....
2. " "	14.4	225.4	87.33
3. " "	13.1	224	86.65
4. " "	13.8	222.5	....
5. " "	12.9	225.8	....
6. Oleomarg. butter,	0.6	197.4	95.56
7. " "	0.4	195	....
8. " "	0.5	194.5	....
9. " "	1.4	196.9	....
10. " "	1.55	194.7	....
11. Suspected butter,	13.25	227	86.01
12. Butter,	12.9	226.3	....

There is no doubt that No. 11 was unjustly suspected.

The writer found his duplicate tests by Reichert exceedingly satisfactory in the very few cases where he made them; thus No. 12 gave 12.9, 12.9 and 12.8, the two last results being obtained when an inverted condenser was attached to the flask during saponification, to avoid anticipated loss of butyric ether. Another butter gave, in duplicate tests by different persons, 14 and 13.8 cc. Another butter, about one-half pound in quantity, which gave in May, 1884, 13.8 cc., was kept in a loosely-covered vessel in the laboratory during the next eight months, the thermometer rising at times to above 90° Fahr. It was then found to be very rancid, smelling like cheese, covered on top with a dark mould, and in large part changed to a brown mass. A fair average sample of it now required 13 cc. of one-tenth normal alkali, showing that Reichert's method is still applicable to very rancid butter, although it would doubtless be well to lower the standard for such a butter—about to Sendtner's suggested limits.

Reichert's test has maintained itself very well, so far as the preceding authorities show. Beckurts (Wagner's *Jahnesbericht*, 1883, 978, an abstract from *Pharm. Centralhalle*, 1883, 557), following Reichert's method exactly, used from 15.6 to 17.5 cc. of one-tenth normal alkali, and thinks Reichert's standard is too low. His results, if we accept those of Medicus and Schorer on melted butter already quoted, are unique and need confirmation. Wagner does not state how many butters Beckurts tested. It may be added that Beckurts

gravely asserts that Reichert's proportions must be exactly observed, and naively states that when he dissolved the soap in 150 cc. of water, instead of 50 cc., he used only 11.9 cc. of one-tenth normal alkali to neutralize the first 50 cc. of distillate! It does not seem necessary to raise Reichert's standard until others shall have obtained figures as high as Beckurts found.

A. Hanssen. (*op. cit.*), following Meissl's modification, obtained a confirmation of his results.

E. Reichardt (*Archiv der Pharmacie*, 222, 1884, 93), following Reichert's method, obtained as the average from 35 genuine butters, 14.16 cc. one-tenth normal alkali, with extremes of 13.8 and 14.7. His experiments were systematically conducted so as to include butter made in every month of the year, and with every variety of fodder for the cows, which were of Dutch breeds. Reichardt states also that recent tests by Birnbaum, in Baden, never required less than 13 cc. one-tenth normal alkali, at whatever season of the year.

The only proposition to lower Reichert's standard, or at least the standards of Seudtner and of Meissl, has been made by Munier (Fresenius' *Zeitschrift*, 1882, 394). He concluded, from his experiments on pure butters at Amsterdam, Holland, that the standard should be varied for different months; making it 11 cc. from August to October; 10 cc. from October to March; 12.1 cc. from March to May, and 12.4 cc. from May to August. He found, in the case of one butter, made in December, as low as 9.2 cc., one-tenth normal alkali. His figures, which include a large number of butters, range from 9.2 (in December) to 14.5. Why did he not at once propose to reduce the limit to 9.2 cc., at least for December? These figures of Munier would greatly lessen the value of Reichert's test, if Munier had followed the latter's method. But he did not. He saponified with 5 cc. of a solution of 20 grains caustic potash in 100 grains of 70 per cent. alcohol; that is, he used only one-quarter as much alcohol. Moreover, he decomposed the soap with phosphoric acid solution, instead of sulphuric acid (20 cc. of a mixture of 4 parts phosphoric acid solution of 1.1595 sp. gr. with 6 parts water). Finally, he removed the alcohol by sucking air through—he does not say what, whether through the still liquid soap, or through the flask—after the soap solution had been concentrated by evaporation. These modifications he calls "unessential." In publishing results calculated to discredit Reichert's process, without publishing any comparative analyses

to prove that his process always gave the same results as Reichert's, Seudtner (*loc. cit.*) rejects his results altogether. Reichardt says: "It is not commendable to offer constantly modifications of a method without giving comparative tests, which must show that the new modification gives exactly the same results." The experiments of Reichardt, Seudtner and Birnbaum, already quoted, were made with the express purpose of testing Munier's conclusions as to variation in the results of Reichert's process with butters made in different months, and they, as well as the writer's briefer experience, give his theory absolutely no support.

Reichardt thinks it possible that the small quantity of alcohol used by Munier may be the cause of his low figures, and states that several of his own experiments show this to be the case, but he gives no analyses to support this statement.

Direct comparison of Reichert's and Munier's methods were instituted in the laboratory here at Princeton, N. J. When phosphoric acid prepared from glacial acid by long boiling with water, was used, Munier's method gave extremely low figures, often as low as 6 or 7 cc.; but with phosphoric acid (Merck's) bought for the purpose, better results were obtained. The experiments so far conducted indicate that Munier's process gives lower figures than Reichert's, as shown by the following tests with genuine butter:

	Reichert.	Munier.
No. 1	13.10 cc.	12.00 cc.
	13.15 "	12.15 "
	13.10 "	12.05 "
No. 2	12.80 "	11.45 "
	12.75 "	11.50 "
No. 3	13.10 "	12.45 "
No. 4	14.25 "	14.20 "
No. 5	14.40 "	14.20 "
No. 6	13.60 "	13.15 "

Until Munier's figures have been confirmed by further tests of his own, or by other chemists, they cannot be received as conclusive.

The essential feature of Reichert's process consists in the limited fractional distillation which it secures. The writer has been asked why he preferred to follow Reichert, and distill over only part of the soluble (volatile) fatty acids, rather than, as is the practice of some analysts, to distill so long as any acid comes over. To do this would be to lose the whole advantage of Reichert's process. Cocoanut oil

yielded to the writer, by Reichert's process, a distillate requiring 3.5 cc. of one-tenth normal alkali, the experiment giving these figures three successive times. On adding 50 cc. of water to the decomposed soap solution, and again distilling off 50 cc., a distillate was obtained requiring 2.3 cc.; repeating the addition of 50 cc. of water and distillation of 50 cc., 1.5 cc. of one-tenth normal alkali was required; the fourth trial gave 1.4 cc.; the fifth, 1 cc.; the sixth, 0.9 cc.; at which point the experiment was stopped, although manifestly the volatile fatty acids were by no means all distilled over. A genuine butter similarly treated required for the first distillate of 50 cc., 13.6 cc. of one-tenth normal alkali; for the second, 1.65 cc.; for the third, 0.45 cc.; for the fourth, 0.25 cc.; at which point the experiment was stopped. No further argument seems necessary for adopting Reichert's plan.

The writer is convinced that Reichert's is the only one of the three methods depending on Hehner's principle, which he has tried, that is with any practical degree of accuracy capable of distinguishing between cocoanut oil, in mixtures or alone, and pure butter fat.

The comparative tests of butter by Reichert's method and Munier's modification, were made by Dr. L. W. McCay, of Princeton College, with one exception.

REPORT OF SHIPPEN WALLACE, MEMBER OF THE COMMITTEE OF ANALYSTS.

I submit my report of work done the past year, as one of the analysts appointed by the State Board of Health.

For Dr. Wm. K. Newton, the State Inspector of Milk, I have made a number of analyses of milk which had been condemned by either him or his deputy, and have also made eight analyses of milk, the purity of which was known, at the request of the owners of the cows. The result was to confirm the fact that the State standard of twelve per cent. milk solids is not too high. The prejudice against the milk law which has existed in West Jersey among a number of producers, still continues, but, I think, not to as great an extent as formerly. The quality of milk supplied to the consumer has certainly improved, and especially in Atlantic City.

In the report of Prof. Cornwall, for 1881, he mentioned the fact that in the examination of canned goods, which he had made, he found that canned asparagus contained tin to a much greater extent than any other canned goods which he had examined. Thinking that it would be well to investigate this subject more fully, I have during the past year examined the canned asparagus to be found in the market, with the result of confirming this statement to a greater extent than I had expected. He mentions the fact that in one one-quart can he found 4.13 grains dissolved tin. Whether the length of time the asparagus is canned before being used has any particular influence on the amount of tin taken up, I do not know, but it seems likely it has. The reason for this canned article of food containing tin to the extent it does, lies no doubt in the vegetable acid, asparagaric, present. It is not uncommon to find tomatoes, peas and corn in which no tin can be detected, but in the article referred to, of the ten different cans examined by me, there has not been the slightest difficulty in detecting its presence; although I am not aware of any cases of sickness produced by eating canned asparagus, yet such may have been the case.

There is to be found in the market this same article sealed (?) in glass, and I do not know but that it might be well for the attention of canners to be called to the fact that in putting up in tin they run the risk of some one being made sick by eating it, and to advise them to use glass. In one can I obtained over seven grains dissolved tin (7.11 grains); in another, 3.92 grains, and three yielded over 5 grains. The quantity in the remaining five cans was not determined, but there was no difficulty in detecting its presence. All canned goods should be removed from the can as soon as opened, and, if not used, kept in some earthen vessel, and should by no means be cooked, as is often done, in the original tin. This subject is an interesting one, and I should like to see it examined to the extent of analyzing all the brands of asparagus in the market, and also noting the length of time since being put up.

The examination of kerosene has been continued. I have learned of no accidents resulting from its use in West Jersey, but that there have not been any, I am not prepared to state.

I have examined in all twenty samples, which, at the time they were obtained, I had every reason to suppose would not come up to the State standard, inasmuch as they were not bought for "head-light oil" (150° fire test), but simply for kerosene, which, as a rule, is 110-112° fire test, and which, as I stated in my report of last year, will flash at from 90-95°. They all flashed between these points. I have found no oils sold under fancy names except in one case. This party sold last year, and I have notified him that in case he continues the law will be enforced. He is thoroughly aware of the law, but seems inclined to ignore it. The oil is sold under the name "Genii oil," and is substantially benzine. The samples examined were obtained in Camden, Salem, Atlantic City and Bordentown.

NOTES ON SOME SAMPLES OF KEROSENE.

BY PROF. H. B. CORNWALL.

I have the honor herewith to submit my report on various samples of kerosene. The samples were collected in the latter part of November by Mr. James H. McGuire, Inspector, of Trenton, N. J.

Twenty-two samples were tested, having been collected from the following places: Manasquan, Monmouth county, 4; Englishtown, Monmouth county, 1; Point Pleasant, Ocean county, 4; Trenton, Mercer county, 5; Bound Brook, Somerset county, 4; Lambertville, Hunterdon county, 3; Princeton, Mercer county, 1.

The tests were all made according to the regulations in the last report of the New Jersey State Board of Health; duplicate tests being made of all flashing below 100° Fahr. It will be seen from the figures below that oils are still sold in this State which do not come up to the required standard of safety.

Temperature of oil at flashing...............	96°	98°	99°	100°	102°	104°
Number of samples..............................	1	1	3	10	5	2

NOTES BY WM. K. NEWTON, M.D., MEMBER OF THE COMMITTEE OF ANALYSTS.

During the past year seven samples of kerosene have been sent to me to be tested, all of which proved to be up to the State standard.

In Paterson, the introduction of gasoline stoves for cooking purposes brought up the question, whether the law contemplated the regulation of the sale of gasoline and naphtha for heating purposes. After reading the law and after consulting legal authority, it was found that the law only regulated the sale of oils intended for illumination.

The agents for the stoves were, however, notified that the gasoline could only be sold in cans or vessels, marked "not for inside light." The papers published articles warning persons about the dangerous character of naphtha and gasoline, and some little good was done.

As was anticipated by me, the danger of using these very explosive articles was soon made very evident by the explosion of two reservoirs connected with the stoves and the destruction of much property. Fortunately, no lives were lost.

Some samples of "noodles" were collected in Newark, as it was thought they were covered with chromate of lead. The samples were sent to Prof. H. B. Cornwall, but at the time of writing the analysis has not been completed.

It seems to me essential, to a proper enforcement of the law, that rules for the government of analysts and inspectors should be adopted.

REPORT OF THE MILK INSPECTOR.

WM. K. NEWTON, M.D., PATERSON, N. J.

I herewith hand you my fifth annual report.

The work of inspection done during the year just past has been much the same as that performed in the past four years, and it seems hardly necessary to burden this report with many details, as it would be but a repetition of former reports.

I have visited nearly all the dairy sections of the State, besides inspecting the milk supplied to many of our principal cities and health resorts.

Mr. Peter L. Vandegrift has acted as my assistant in the southern and western parts of the State, and has inspected the milk supplied to the cities and towns of Gloucester, Camden, Burlington, Salem and Atlantic counties, and Atlantic City, Cape May and other summer resorts. He has proved to be a careful and conscientious worker, and has done exceedingly efficient work.

Mr. Henry B. Everhart, of Stevens Institute, was appointed assistant for Hoboken and Jersey City, and by strict attention to duty has done much to insure the purity of the milk supplied to those cities.

Messrs. Edward R. Martin and William Moller, the former Chemist and the latter Inspector for the New York Dairy Commissioner, were also appointed assistants and given power to inspect milk in this State. This was done so as to enable them to have supervision over milk produced in New York but passing through this State destined for New York city. They have aided me very much.

The New York State Dairy Commissioner, Mr. Josiah K. Brown, appointed me chemist to his department—a complimentary office, but one that gave me authority to inspect milk in that State.

The Legislature of 1884 enacted an amendment to the milk law which gave defendants a right to a jury trial; also, entitling them to

an appeal from justices' courts to the Courts of Quarter Sessions. This law, then, is equivalent to one which entitles all persons, tried under the milk act, to two jury trials, and hence increases the chance of escape through various legal technicalities.

I adhere to the opinion, formerly expressed, that in public health matters speedy trial is necessary, and the character of the evidence offered is such that no jury is required. The judgment of juries, drawn to try cases under this act, is apt to be biased by local associations and prejudices. This has often proved to be the case.

In a trial held in Sussex county, where not only was the evidence offered by the State convincing, but was supplemented by a written confession of guilt by the defendant, the jury failed to agree.

In another case, tried on appeal to Quarter Sessions, the judge charged the jury to bring in a verdict in accord with the evidence presented, yet a verdict of "not guilty" was brought in.

During the year twenty-seven complaints have been made against persons violating the milk law. Of these, thirteen entered a plea of guilty; four were tried and convicted, and ten cases are now pending in the courts. The sum of $850 has been collected by the justices for penalties and should have been paid into the State treasury before this time.

In many instances, when dissatisfaction has been expressed respecting the State standard, I have offered to have any dairy examined free of cost, but the offer has never been accepted.

The limit set up by law is still disputed by all against whom complaints have been made in court, and I doubt not that if the standard was reduced to ten per cent. of milk solids, that some would be found to claim such a figure too high. We have proved to our own satisfaction that our limit is just and accurate, and not too high for commercial milk. It has been adopted in New York State, with the rigorous requirement that all milk shall contain three per cent. of fat and twelve per cent. of cream by volume. In Massachusetts, thirteen per cent. of solids are required by law, and the limit has been repeatedly sustained by the courts.

Very little assistance was rendered, this year, by local Boards of Health. With one or two exceptions there seems to be decided apathy for the work. In Newark, where last year a great amount of work was done, hardly any cases have been tried. At Asbury Park, the usual energy has characterized the local Board, and supervision of the milk-supply has been maintained.

In closing, I would repeat a few suggestions that I have before offered:

With so excellent and comprehensive a law as that enacted to prevent the adulteration of food and drugs, it seems to me unnecessary to have a special milk law. If an amendment was enacted requiring the Inspector to make his complaints, for milk adulteration, under the food law, and at the same time enabling him to inspect other foods, a great deal of very efficient work would be done.

It seems to me necessary, also, that local Boards of Health be invested with power to compel a registration of milk dealers, and to make such registration a prerequisite before selling milk. The cow-stables, also, should be placed under supervision. It is almost impossible for the Inspector to visit all towns in the State, and local Boards should be compelled by law to aid in this work.

The law has operated well this year, and the undersigned, while fully aware of the unpleasant position in which he is often placed, would rely on the support of honest and unprejudiced citizens and those interested in sanitary progress.

CIRCULARS AND LAWS.

CIRCULAR XLIV.

OF THE

STATE BOARD OF HEALTH OF NEW JERSEY.

HOW TO PREVENT THE SPREAD OF SMALL-POX, SCARLET FEVER, DIPHTHERIA AND OTHER COMMUNICABLE DISEASES.

These diseases are spread by infectious particles which pass from person to person, directly or by means of discharges (called secretions or excretions), or by clothing, furniture or other surroundings. We seek to prevent this transfer, chiefly as follows:

a. By avoiding contact as far as possible or proper.
b. By abundant supply of pure air and ventilation.
c. By removing all unnecessary materials which receive or absorb the infective particles.
d. By the most exact cleanliness of persons and things.
e. By disinfectants.

We specify the diseases with which we have most to deal and the chief sources from which the particles are diffused:

f. Small-Pox.—From the pustules, chiefly of the skin.
g. Scarlet Fever.—From the mouth, throat, nasal passages and the skin.
h. Diphtheria.—From the mouth, throat and nasal passages.
i. Measles.—From the mouth, throat, nasal passages and skin.
j. Whooping-Cough.—The expulsive breath from the air passages; also from the sputa.
k. Typhoid Fever.—The discharges from the bowels, and perhaps constant exposure to other secretions or excretions from the patient.

As to small-pox, its contagion is very diffusive, and continues for a long time in the scabs of the pustules.

Scarlet fever is probably conveyed by the peeling skin longer than by the breath, but it is not so diffusive as small-pox or measles.

Diphtheria is not communicable at long distances, except in very close rooms. The membrane itself is the most dangerous source of contagion, particles of which may be carried and impart the disease at almost any distance if there is not full exposure to air.

Measles is very communicable, and probably more so because the cough tends to propel and diffuse the breath, laden with infective particles.

The same is true of whooping-cough, and besides, the sputa or phlegm, when it becomes dry, helps to diffuse the infection.

Typhoid fever seems chiefly to be communicated by the discharges, after they have undergone change by exposure to the air and to materials such as milk, which can absorb the particles, and when used convey it into the system.

It is true of this and the other contagions above named that they may pass into water or food as well as air, and be conveyed into the system by such means.

While these are the chief, they are not the only infections which may be conveyed.

Thus typhus fever is directly conveyable through the breath or the eruption.

Cholera, like typhoid fever, is conveyable chiefly through the discharges.

There is a follicular form of sore throat which is different from that of scarlet fever or diphtheria, which often seems to be communicated by near contact or inhalation of the breath. Direct breathing in of the breath of others is never healthy, and should be guarded against, especially where there is sickness.

Mumps are communicable at a small distance.

Some forms of skin diseases are conveyed by contact. Persons with any form of sore eyes, or unnatural discharges of any kind, should not use a towel which is to be used by others.

It is now believed that to some persons consumption may be communicable where there is imperfect ventilation, or to some susceptible persons who are constantly brought in direct contact with the breath or dried sputa of one sick with this malady. Individual care and

cleanliness go a great ways in preventing the catching and in reducing the severity of any disease.

Personal cleanliness, personal good habits and good health help to ward off many diseases.

We have selected the six diseases first named because they are the chief ones to which so many are exposed, and which, therefore, most need guarding against.

We may name some general rules which apply with nearly equal force to all of these diseases :

1. When any one has sore throat, foul breath, or eruption, however slight, he should be kept apart from all except an adult nurse or attendant, until it is known whether he has some one of the communicable diseases. If there has been known exposure to any communicable disease, special precaution should be used. Mild cases, just because they do not prevent moving about, often communicate these diseases. Scarlet fever does not, as a rule, occur sooner than six days, and diphtheria in from six to twelve days. Small-pox and measles not sooner than twelve days. There should be early diagnosis of what the disease is by some skilled person, even when the attack is mild and does not require much subsequent attendance.

2. Every person suspected or known to be sick of small-pox, scarlet fever, diphtheria, measles, &c., should be isolated from all other persons except necessary attendants. The garments of the patient and those of the attendants should be of such material as will admit of disinfection, boiling and washing. Persons entering or remaining in the room should not take off such garments as hats or coats or gloves, and put them on again in the room, as they thus serve to enfold and convey infective particles. Nurses should have occasional baths and be scrupulously clean, and, if compelled at any time to mingle with others, should first, after washing in some mild disinfectant, expose themselves a few moments to the open air. Close cutting of the hair and beard is often advisable. Women should have the hair covered by a cap ; men when nursing, especially in small-pox, should remove the whiskers. It is quite certain that the smaller domestic animals, as the dog and the cat, convey, and may even contract some of these diseases. They should never be allowed in the sick room. No food, or milk or water which has stood in the sick room should be partaken of

by others. Dishes long in the room should be rinsed in some disinfecting fluid before removal.

3. The bedroom of a person sick with small-pox, scarlet fever, diphtheria, measles, &c., should be cleared of all unnecessary furniture, clothing or drapery, and of all kinds of bed or bedding that are not needed. Articles in the room when the sickness had fully begun, should not be removed to another room until they have been in the open air. Often it is best to remove the carpets, as rugs will answer and are more easily cleansed afterward. The room should never be less than 10x14, with an eight or nine-foot ceiling, and capable of having plenty of light admitted. It is better not to have the bed put in a corner or against walls. It is important that windows be so located as to admit of good ventilation without draught on the patient. If a piece of board is placed under the length of the lower sash so as to cause an opening between the lower and upper sash, or if there is at the top of the window a wire gauze slanting toward the ceiling, or any other arrangement for letting in air and yet interrupting a direct downward *draught*, much air can be admitted without any current being felt.

4. Discharges from the nose or the mouth, and from the throat and lungs, should be received upon cloths or rags or soft paper, so as to be quickly burned, or put into cups or vessels containing some one of the disinfectants hereafter named. Handkerchiefs are convenient, but too often are left to become soiled, or to convey contagion. After they are soiled, at once put them in very hot water or some disinfectant.

The discharges from the bowels and the bladder should be passed into vessels containing a pint of disinfectant, and without undue delay be buried at least one hundred feet from any well. When this is impracticable, the use of the disinfectant should be more plenty, and the removal to the common receptacle should be speedy.

The soiled bed or body linen or towels of the room should not be mingled with other soiled clothes, or put into the general wash or wait for the weekly washing, but should be covered over with a disinfecting fluid or promptly cleansed by hot water, and by the usual laundry methods.

5. No person who has recovered from small-pox, scarlet fever or diphtheria should mingle with others until there has been washing of

of the whole body and entire change of clothing. The time for return to society must be regulated by the physicians.

Two weeks after *complete* recovery from diphtheria or measles is usually sufficient. But by complete recovery—we mean this lapse of time *after* all symptoms have disappeared. After small-pox or scarlet fever, a longer period must elapse, since the skin is for some time separating its contaminated particles. From four to six weeks is the time generally named, but very much depends as to time upon the home cleanliness of the family and of the person.

When death has occurred from any communicable disease, the body should be washed with a chloride of lead or zinc, or corrosive sublimate solution of double strength of that described under disinfectants, and then be wrapped in a sheet wet with the same. Shavings or "excelsior," moistened with a disinfectant, may be placed under the body. In no case should the body be exposed to view. In most cases it is desirable to avoid a public funeral, and especially the attendance of children. Much depends on the skill and knowledge of the undertaker. (See Third Report, pp. 111–121.)

Disinfection of House and Surroundings.—The first requisite is the most thorough exposure of the room to air, unless it is in such very close proximity to other buildings as that it is best to *fumigate* first.

The following directions will guide as to materials and methods of disinfection.

Disinfectants to be Employed.—1. Roll sulphur (brimstone) or chlorine gas for fumigation.

2. Sulphate of iron (copperas) dissolved in water in the proportion of one and a half pounds to the gallon; for soil, sewers, etc.

3. (Zinc solution) sulphate of zinc and common salt, dissolved together in water in the proportion of four ounces sulphate and two ounces of salt to the gallon; for clothing, bed linen, etc.

4. Thymol solution.—Two drams of thymol (crystals) dissolved in ten drams of alcohol, twenty drams of glycerine, and one gallon of hot water.

5. Solution of corrosive sublimate.—One ounce to eight gallons of water.

6. Commercial sulphuric acid.—One pint to eight gallons of water.

How to Use Disinfectants in the Sick-Room.—*The most available agents are fresh air and cleanliness.* The clothing, towels, bed linen, etc., should at once, on removal from the patient, and before they are taken from the room, be placed in a pail or tub of the zinc solution, *boiling hot* if possible.

Unnecessary furniture—especially that which is stuffed—carpets and hangings, when possible should be removed from the room at the outset; otherwise, they should remain for subsequent fumigation and treatment.

All discharges should either be received in vessels containing copperas solution, or, when this is impracticable, should be immediately covered therewith. All vessels used about the patient should be cleansed with the same solution.

One-half pound of sulphate of iron (copperas or green vitriol), or one ounce of sulphate of zinc (white vitriol), or one ounce of sulphate of copper (blue vitriol), or one ounce chloride of zinc (butter of zinc), or one ounce of chloride of lime (bleaching powder), put to a quart of water will answer for this purpose.

Fumigation with sulphur is a practical method for disinfecting the house. For this purpose the rooms to be disinfected must be vacated. Heavy clothing, blankets, bedding, and other articles which cannot be treated with zinc solution, should be opened and exposed during fumigation, as directed below. Close the room as tightly as possible, place the sulphur in iron pans supported upon bricks placed in wash-tubs containing a litttle water, set it on fire by the hot coals or with the aid of a tablespoonful of alcohol or saltpetre, and allow the room to remain closed for twelve hours. For a room about ten feet square, at least two pounds of sulphur should be used; for larger rooms, proportionately increased quantities, placed at two or three points.

To disinfect an ordinary room with chlorine gas: having tightly closed all the openings of the room, place in it an earthen dish containing four ounces of peroxide of manganese. Pour on this one pound of strong muriatic acid, being careful not to breathe the fumes. When certain that continuous liberation of chlorine is taking place, leave the room and close the door.

Cellars, yards, stables, gutters, privies, cesspools, water-closets, drains, sewers, &c., should be frequently and liberally treated with copperas solution. The copperas solution is easily prepared by hang-

ing a basket containing about sixty pounds of copperas in a barrel of water, or by dissolving in hot water a few pounds of copperas.

Corrosive sublimate is cheap and has excellent disinfectant properties, and can be used the same as the iron or zinc sulphates. The vessel containing it should be marked "poison."

Sulphuric acid has been found very effective for sprinkling and general disinfection.

Where a disinfectant wash of pleasant odor is desired for common use by the person sick or the attendant, the thymol solution, derived from thyme and some other plants, answers a good purpose.

We have not especially referred to carbolic acid and other phenol compounds, because, while useful, they are not preferable to those already named.

BODY AND BED-CLOTHING, &c.—It is often *best* to burn articles which have been in contact with the persons sick with contagious or infectious diseases (and especially if the disease be small-pox). Articles too valuable to be destroyed should be treated as follows:

a. Cotton, linen, flannels, blankets, &c., should be treated with the boiling-hot zinc solution. Introduce piece by piece, secure thorough wetting and boil for at least half an hour.

b. Heavy woolen clothing, silks, furs, stuffed bed-covers, beds and other articles which cannot be treated with the zinc solution, should be hung in the room during fumigation, their surfaces thoroughly exposed, pockets being turned inside out. Afterward they should be hung in the open air, beaten and shaken. Pillows, beds, stuffed mattresses, upholstered furniture, &c., should be cut open, the contents spread out and thoroughly fumigated. Carpets are best fumigated on the floor, but should afterward be removed to the open air and thoroughly beaten.

After fumigation it is desirable to cleanse all wood-work with soft soap and hot water, to thoroughly brush hard or papered walls and to whitewash the rest. A thorough, general house-cleaning is desirable.

Circular VIII. of this Board, as contained in the third and fourth reports of the Board, pages 85 and 260, gives other important directions as to cleanliness and disinfection.

The question whether beds can be safely fumigated and re-used, will depend upon the amount of soiling or use. All things which are not to be or are found not capable of being thoroughly cleansed, should

be at once burned. As contagions are often stored up and kept over because of imperfect airing and cleansing, safety depends upon what has been done after the cases have ceased.

In these directions it is not claimed that in every case of communicable disease there is to be so much labor and destruction. But the most perfect methods are presented as models, to be varied, if proper, under the advice of the physician, who also thus needs to be reminded of what *thorough disinfection means.*

SPECIAL DIRECTIONS AS TO VACCINATION FOR THE PREVENTION OF SMALL-POX.

With the present facilities for travel and the thoroughfare character of this State, there is no reasonable expectancy that any person will reach the age of twenty-one without great risk of small-pox, unless the disease is prevented by vaccination. The person who runs the risk not only endangers his own life and comfort, but imperils others to a degree not justifiable.

By the provisions of the Health Law of March 11th, 1880, all school boards are authorized to vaccinate, at public expense, any pupils attending school who are unable to procure vaccination.

All local Health Boards need to see to it that vaccination is recommended, as well as rapid isolation of cases secured, if any occur. The cost of local epidemics of small-pox is very great, besides the peril to life and public health. The prevention of the disease is within the range and duty of your control. All our local Health Boards and School Boards should co-operate in influence and provision for more general vaccination, and for revaccination of persons who have not been vaccinated since full growth. The heads of large manufacturing establishments need to attend to it, both in the interest of capital and labor.

Bear in mind and act upon the following suggestions:

I. Let every parent see to it that each child is vaccinated before one year of age, and sooner, if possible.

II. Let no teacher or child be admitted to a public school without vaccination.

III. Let provision be made by school trustees and Boards of Health for free vaccination to such as need this provision. (See *Chapter 153, Section 10, Laws of 1880.*)

IV. Would it not be well, just before each April vacation, to have schools close an hour earlier and thus have a *vaccination day*, on which all scholars could be invited to be vaccinated by their physicians, at home, or, by some public arrangement, at the school building?

V. Do not concern yourself about the kind of vaccine or lymph used any more than you would about the source of medicine you take, but hold the physician responsible therefor. Have the sore examined and take a certificate from the vaccinator that, in his judgment, you are successfully vaccinated.

VI. Have vaccination repeated or retried after the age of sixteen. Most persons, if fully vaccinated the first time, will have but little result from the repetition, but it is advisable to have this additional assurance of safety.

VII. If small-pox or varioloid occurs in your house, do not attempt concealment. At once send for your physician and do as he advises you, or notify the Board of Health. Have every member of the family vaccinated. By some means prevent the possibility of persons coming in unawares. If you know of any person who has been exposed, send him word so that he may be vaccinated.

VIII. Where there are factories, the superintendents should advise or direct all their employes to be vaccinated.

Most of our physicians have full confidence in humanized vaccine lymph, which is easily secured. *Vaccine lymph directly from the animal* is preferred by those who have any fear of communication of other diseases through humanized lymph—a fear that is greatly magnified in the popular mind. It is, nevertheless, due that all have their preference, and that where vaccination is insisted upon as a condition of school attendance, bovine lymph be used, if desired. Many physicians prefer to use this. The New York City Board of Health, 301 Mott street, New York, furnishes it daily by mail. H. A. Martin & Son send it direct from their herd, Roxbury Station, Boston, Mass. Dr. E. L. Griffin, State street, Chicago, is prompt in remittal. Ready supplies can also be had from Philadelphia and other cities. The price per point is about twenty cents, and less in larger quantities. There is reason to believe that much is sold for bovine lymph which is not such, or that there is a failure in effect because of age and imperfect keeping.

We urge upon all physicians great exactness in selecting lymph, and upon the people protection from the disease. Its outbreak every

few years is not a proof of epidemic tendency. The periodicity rather occurs because that, after an epidemic, as soon as years enough have passed for a younger product of children to be out in public child-life, the susceptible material becomes so abundant as to insure extension if a single case is introduced from another section. Then there is an outbreak of small-pox and of vaccination. Would it not be better if, somehow, the young population could be systematically protected? Let our various communities and the local Boards secure this, not only under present threatenings, but as a wise preventive measure.

Small-pox is the one contagious disease which ought never to occur, and which could forever cease if the preventive methods now well understood could be enforced. Every case is the result of public or personal imprudence. Where one has been exposed, unless there has been recent vaccination, he or she should be at once vaccinated. If this has been neglected, it should be done even if there has been neglect for several days after exposure. It is not certain but that thorough vaccination, even when too late to prevent an attack, mitigates the severity of the secondary fever.

GENERAL PREVENTIVE MEASURES.

All contagious diseases should be reported to the Board of Health, since public safety requires it, especially in cities, and no public use is made of the fact, save where there is great danger of an epidemic.

Every local Board should have its executive officer, who should know how to stop the spread of the fire before it has attained headway. We urge upon all local boards the prevention of small-pox, scarlet fever, diphtheria and other preventable diseases.

To pursue a disease, in order to stop it, is often a duty; to get ahead of it, both a privilege and a duty, and very often possible. To prevent is to anticipate, to go before; and Health Boards, as well as individuals, may thus be of great service. Afterthought is sometimes good—forethought is better.

When a case of contagious disease occurs in your district, do the right thing promptly, and do not waste the first week in consultations.

While it cannot be claimed that this or that kind of filth can account for the outbreak of every particular or specific disease, we do know *that cleanliness* of person or of surroundings are great preventives or checks to contagions.

Pure air, pure water, pure homes, pure soils, pure persons and pure surroundings are the surest safeguards against disease of every kind. Where an epidemic occurs in any locality, it may here and there alight upon those whose homes are in good sanitary condition. But it is wonderful to see how general is the rule that pestilences have their choice of persons and places, and how uniformly those who can furnish the most insanitary conditions are surest to be visited. Malignancy is often in direct proportion to uncleanliness and filth, or to errors in methods for the disposal of decayable material.

Secure dryness for every part of your dwelling, and proper drainage, fresh air and sunlight.

Examine the cellar or basement and see that it is dry and clean, with whitewashed walls, with no concealed wells or cesspools, or decaying vegetables.

See that all house soil-pipes and connections are properly trapped, ventilated and disconnected from the outside cesspool or sewer by a trap, and also an intervening air opening, and that the house system also has a ventilating opening on the roof. Have all garbage frequently removed. Decomposing heaps of animal or vegetable matter near the dwelling are always hazardous.

If wells are used for drinking water, their surroundings should be perfectly clean, no vessels being rinsed by them nor any slop-water thrown on the ground near them; nor should cesspools or privies be located within a hundred feet.

If a cistern is used, it should be cleaned each year or oftener. If at any time the odor of water becomes bad, do not use it without boiling, until you have ascertained the cause.

If only individuals and local Boards recognize the conditions under which communicable diseases occur and spread, and, when they do occur, act promptly and intelligently, it is surprising how life is saved, disease diminished and epidemics prevented.

For copies of all circulars, address E. M. Hunt, M.D., Trenton, N. J.

Trenton, April 15th, 1884.

CIRCULAR XLV.

OF THE STATE BOARD OF HEALTH OF NEW JERSEY.

CHOLERA.

TRENTON, N. J., January 1st, 1885.

Whenever the possibility of an outbreak of cholera is threatening, all methods for thorough cleanliness should be applied with renewed vigor. For it is a mistake to suppose that cholera falls like a thunderbolt and accomplishes wide-spread destruction without regard to locality. On this point the Cholera Commission of the German Empire, which convened in 1873, and has met from time to time since and just reported (1882), is full and explicit. "The most important part is played by the locality itself to which the disease germ is brought." It depends in part on "the saturation of the soil with the decomposition of certain substances, and a condition of soil which favors such decomposition." Part VI., pages 314–318, says: "The commission expresses the united opinion of all the most experienced physicians when it says that the strictest attention to all the measures demanded by public general hygiene, offers the best protection against cholera."

Along highways of travel, as wherever else it lights, with occasional apparent exceptions, an analysis of the facts shows the rule to be that its virulence is in proportion to the neglect of sanitary conditions. "It is spread more by infecting localities than by infected persons."

For these reasons city and village officers and all householders should see to it that no form of decomposable matter is kept on or about the premises, that all pipes are thoroughly flushed and ventilated, that there be close inspection of dwellings and surroundings, that pure water and wholesome foods are used, and where soil or cesspools are already filth-sodden and cannot be removed, that the disinfecting solution of copperas and carbolic acid herewith recommended be thoroughly and frequently sprinkled.

But because "all measures for the cleansing of the soil and its better drainage are too often too late when begun, at the time of the outbreak of an epidemic, all places should institute close sanitary

inspection and proper cleansing in advance, so as to prevent an outbreak or limit its extent."

In dealing with epidemics which come from without, a great secret of success is in doing beforehand all that can be done to prevent the settling and spread of the disease, and in learning just what you will do with the first case or cases that occur.

Whatever may be the differences of opinion, we are safe in acting on the basis that the following facts are settled as to cholera :

I. Although the view of direct contagion is not supported, transmission of the disease takes place without doubt in two ways : (*a*) From the patient particles or secretions are thrown off which are not capable at once of acting as cholera poison, but which in a few hours are so changed as to become the specific poison ; and (*b*) so also in the presence of such a center of infection, material for disease may attach itself to soil, locality and surroundings, and "whenever it finds appropriate conditions for its reproduction, it may light up an epidemic."

While these facts need not cause attendants to fear catching the disease, they are reasons why the patient should be isolated, why only persons needed should be in attendance, and why all in charge lose not the opportunity of dealing with materials and surroundings which, although not cholera poisons, are quite sure to become so if nothing is done.

As persons may unavoidably be brought in contact with infected localities, such are advised to use, at time of exposure and before each meal, two grains of quinine, four drops of aromatic sulphuric acid, and two drops of the tincture of chloride of iron, in a half tablespoonful of water which has been boiled.

In necessary visits to infected premises "consume nothing while there but the air you breathe and carry nothing home."

What to do with the first case that occurs : Consider that the wise management of it may not only determine the welfare of the patient but of the whole community.

1st. Get the history of the case as soon as possible, and take care of all baggage and clothing and all that appertains to the patient. If you can control where the sick person is to be taken, seek isolation from other houses if possible ; if not, an isolated room, and avoid taking the patient into a notoriously unhealthy locality. Carry out a thorough system of disinfection, both in the treatment and as regards all surroundings of the patient. All laundry material should be

placed in a disinfecting solution previous to washing. Some things are best burned if soiled. With this memorandum before him, the health inspector or physician will direct as to what to do with each. He seeks to prevent the locating and transmission of the disease as well as to save his patient. Read carefully Circular VIII. on Disinfectants, or Circular XLIV. on Communicable Diseases.

What to do with premonitory symptoms or with any purging disorder of the digestive tract:

Resolve at once to attend to it and control it, not because it is cholera, but because few who attend to such symptoms ever die of cholera, and because such attacks, if uncared for, seem often to invite the disease. If there is diarrhea, take a recumbent posture, apply a mustard plaster over the abdomen, and if there is a recurrence of discharge, use the following prescription until you have time to seek medical advice:

Laudanum, Spirits of Camphor,	each *one* part.
Tinc. of Ginger, Tinc. of Capsicum,	each *two* parts.

Dose, one teaspoonful in a wine-glass of water.

Or,

Compound solution of Opium (Squibbs', Spirits of Camphor, Spiced syrup of rhubarb, Tincture of capsicum,	of each, equal parts.

Dose, for adult one teaspoonful in a tablespoonful of water.

How to take care of yourself and family during a cholera summer:

Practice a close adherence to all the ordinary rules of health. Most persons are best off where they can control all the circumstances of their condition, so as to be able to have good surroundings, good housekeeping, good, well-cooked foods, and conveniences for bathing, exercise, etc., and for immediate rest or care if there is sickness. Avoid cholera districts unless duty calls. Avoid public water-closets. Make no special change of diet, except to avoid those articles of food which you have found to occasionally disagree. Anxiety of mind, overwork, over-heating, and any irregularity of habit or life seems to invite epidemic influences. The more we analyze facts, the more we find that epidemics do not fall on places or persons at random. While

here and there the most correct and those best situated fall victims, with rare exception the imprudent, the exposed, the poor are the chief sufferers. Be particular as to the use of water, unless you know its source. Tea, hot or cold, or coffee, can be used instead. If you have any suspicion of your own well-water, boil what is used for drinking.

Disinfectants—How to use them.

Fresh air has no substitute. In order to cleanse places already infected, or being made so by sickness, there is need of *draught* through the room or building.

Hot air.—Clothing or bedding is thus cleansed by being put in a furnace of dry heat at from 230° to 300° F. It should be subjected to the heat for about one hour.

Hot water.—Very hot or boiling water is applicable to the cleansing of all garments, utensils, etc., admitting of such a method. Put them in when the water is quite hot and allow it to come to a boiling point. Where garments have been soiled, it is well to throw them first into a tub containing a disinfectant solution and from it transfer them to the water.

A. Iron sulphate, called also green vitriol, copperas, green copperas, (2 cents per pound).—Stir in water until well dissolved, in proportion of one pound to a gallon. A teacupful of this solution should be in the utensil before using, or twice as much added to the water-closet each time of use. For use in sprinkling foul premises make it of double strength.

Carbolic acid solution (Squibbs' No. 2) may be added to it in the proportion of one-tenth.

B. Carbolic acid.—One gill to a pint of warm water, for use in stools, water-closets, sinks, etc.

Chloride of Lime.—A valuable disinfectant, chiefly because it contains from 30 to 35 per cent. of chlorine, which is liberated under proper methods of use. If purchased for cities, it should be tested as to the amount. It is not overrated as a disinfectant if only its quality is known, and its mode of use is judicious. It needs slight moistening, frequent stirring, and sometimes the addition of an acid, as vinegar or common spirits of salt. The test of its efficiency is that the odor of it be kept constantly perceptible.

One pound to a gallon of water for utensils, sinks, water-closets,

drains, &c. One ounce to a gallon of water for all linen, which must not be left long in the solution, but wrung out in fresh water.

Chlorinated Soda, usually known as Labarraque's solution, is a convenient liquid preparation, valuable for use in saucers in the sick-room or in utensils. Its odor should be perceptible to strangers entering.

The chlorides are not to be used with carbolic acid.

C. To disinfect a room, ship or building, so needing disinfection that its contents and surfaces cannot be easily dealt with singly, close the room or building, its windows, doors and chimneys so as to exclude the outer air as far as possible. Vacate the house. Break roll sulphur in small pieces, place it on an iron plate or other metallic dish, and set this on a pair of tongs, or other cross-bar, over an iron pot in which there is water, or over a large box of sand, so as to avoid danger of fire from small particles of burning sulphur. Light it by a few hot coals or some alcohol poured around the sulphur and lighted. Then leave and shut the door after you. A pound and a half of sulphur is sufficient for 1,000 cubic feet of space. The sulphur will convert all the oxygen of the air into sulphurous acid, and all organic particles are likely to be changed. Keep closed three hours after the burning has ceased, and then air well six hours before occupying. Clothing and bedding needing disinfection may be hung on lines and left in the room. Most furniture is not permanently injured, but needs dry wiping and then washing off afterwards.

D. *Lime—Plaster—Charcoal—Dry Earth—Sifted Ashes.*—All these have value, chiefly to be tested by the rapidity with which they correct odors. Fresh slaked lime should be scattered in all places of foul odor. It or charcoal or plaster may be scattered over heaps emitting foul odors. Calx powder is made by pounding one bushel of dry, fresh charcoal and two bushels of stone-lime, and mixing them, and is of great practical use.

All these substances absorb foul gases and dry up moisture, and so help to retard decomposition, or else absorb its results. Where lump charcoal is used it may be refitted for use by reheating it. Quick-lime and ground plaster should not be used where they may be washed into pipes and form lime-soap or obstruct by hardening.

E. One-half pound of sulphate of iron (green vitriol), or one ounce of sulphate of zinc (white vitriol), or one ounce of sulphate of copper (blue vitriol), or one ounce of chloride of zinc (butter of zinc), or one ounce of chloride of lime (bleaching powder), put to a quart of water—any one of these is available for neutralizing discharges or for sinks, used in quantities sufficient to cover the bulk they are intended to disinfect. Where any articles are to be moved from one place to another for airing and disinfection, as trunks, clothing, &c., they should be put in a bag or sheet, like a pillow-case, which is yet moist from having been wrung out in one of these disinfecting solutions.

To sextons and others in charge of the unburied dead:

Use any of the solutions named under E, of double strength for washing. Under and around the body (which should be early placed in the coffin, even if not closed,) use dry chloride of lime or the zinc chloride or the iron sulphate. The body may be wrapped in a solution of these or be placed in a solution in a water-tight coffin. When dry disinfectants only are used, fine shavings, or oakum, or tow, or sawdust, mingled with the disinfectant, or with tar, should be placed beneath and around the hips. A plug at the lower bowel prevents after purging.

Burial should be within thirty hours after death, and the coffin should not be closed early and *then re-opened*, since this lets out concentrated and confined foul air.

For copies of circulars send to E. M. Hunt, M.D., Secretary, Trenton, N. J.

CIRCULAR XLVI.

OF THE

NEW JERSEY STATE BOARD OF HEALTH.

TRENTON, October 1st, 1884.

Inclosed herewith please find an outline for the Annual Report for the year ending October 1st. Under the schedule of subjects for report, in the case of cities and townships which have had Boards of Health and reported previous to this year, it will not be necessary to repeat as to *A*, *B*, *L*, *G*, *I*, *O*, as most of the facts are on file.

Under *A*, in the case of all cities or incorporated towns, it is desirable to report the number of acres included in the incorporation.

C. State exact source of water-supply. If a public supply, is it by the city or a private company? How many houses take it? Is the water ever discolored? Has it an iron or other taste? Is it hard or soft? Is it bad at any one season of the year? Are reservoirs or water pipes cleansed? Does the source or stream from which it is taken receive any sewage above the point of supply? Any other facts as to source, quantity or quality. How many depend on wells? How many on cisterns?

D. As to drainage, state whether any system of drainage for the ground is used as distinct from sewerage. Is the usual water-level such as to secure dry cellars? If there are swamps near you, or malaria is frequent, give particulars.

As to *sewers*, state their construction, their grade or fall per 100 feet, their size, their outfall, their flushing and ventilation, and whole length.

F. State whether houses generally have basements or cellars. If a city, whether the basements are occupied; if country, whether largely used for storage of vegetables. How many tenement houses of more than two families?

H. State how far sewers are used. If cesspools, state whether they are cemented, or whether built with open bottom or sides. How are they emptied?

J. State any known or prevalent diseases. Does the assessor inquire each year as to losses of animals and as to contagious diseases? If a city, is there a register of all persons keeping horses, cows, hogs, etc.?

K. Are slaughter-houses inspected so as not to be a nuisance to neighbors?

L. State any new manufactories, and any evil to health therefrom.

Look carefully at each heading and state what you know.

Do not put down a disease as prevalent unless you have personally known of at least ten cases. Often the physician of the Board should make out or aid in the report, and add such suggestions as occur to him; but let there be no delay to make return during October. We must trust chiefly to the assessor and the physician to keep the other members of the Board acquainted with health conditions, and with the rights and duties of the Board. Any neglects reported to us will be inquired into. Refer to Circular XXXIX., before sent you, for further suggestions. We send from time to time lists of physicians

and of undertakers that you may cross off any deceased or removed, or who do not continue their business. Add all new ones who have *settled* for practice in your city or township. Give name and *post office address*, etc., *plainly*, and only those who are practitioners and who *reside* within the limits you represent. Mail all to us, in envelope herewith sent, by November 1st.

E. M. HUNT, M.D.,
Secretary.

CIRCULAR XLVII.

OF THE

NEW JERSEY STATE BOARD OF HEALTH.

PREVENTION OF SERIOUS INJURIES TO THE MIND, THE EYES, THE EARS.

TRENTON, December 1st, 1884.

It is a noble charity for a State to have *asylums*, where those whose minds have been impaired, or those who are blind, or who are deaf and dumb, can be cared for. It is a nobler charity to prevent such afflictions. Both the individual and the State are involved in such losses. The individual is embarrassed as to the pleasure and profit of useful labor, and the State loses his aid in its own industrial resources. The State also has to make large expenditures for the support and comfort of those who thus become dependent. The dictates of interest and economy unite with those of philanthropy, in leading us to seek for the causes of such calamities with a view to prevent or overcome them.

Mental disability is often the result of early errors and neglects. *Spasms* caused by some indigestible article of food, or by some sickness, not infrequently become chronic by neglect. A single attack is often incidental to other symptoms, and of no grave import. But the system is often left nervous or irritable and at a period more or less remote, another attack occurs. Often a habit of abnormal action is thus made permanent without any organic change at the start.

In other cases imperfect control of disposition or unfavorable surroundings develop into insanity, what at first was only defective self-

control. In some the derangement is the direct result of bodily sicknesses, which have been imperfectly treated or put under skilled medical oversight too late. *Whenever epilepsy or spasm in any form has occurred, it should not only have medical care in the first instance, but the person should from that time be under such medical oversight as will secure treatment to prevent recurrence.* The last ten years mark such advances as to the management of nervous diseases as should lead to a great diminution in a class of cases now found in asylums. The treatment of these cases is very hopeful if begun soon after a first attack. The treatment of all disturbed or impaired mental condition is far more hopeful than formerly, if only it comes at once under skilled treatment. The recovery of persons who have had no treatment for a year is comparatively rare. Many of those now in asylums would never have been there if only their cases had been met at the very beginning of derangement.

THE EYES.

Blindness is rarely congenital, but usually occurs from accident or disease after birth.

Physicians are constantly seeing cases of neglected eye disease, which either end in total blindness or in such impairment of vision as interferes with the pursuit of an industrial occupation. Not a few of these diseases are of a communicable character. A slight inflammation beginning in the eyelids or conjunctiva, or cornea, obscures or destroys vision, although the instrument and the nerve behind it are sound.

Of these the most common is the disease known as purulent opthalmia. We once had occasion to see its ravages in a large school of over a thousand of the London poor, where it was not gotten rid of without the most serious disaster.

C. R. Agnew, M. D., of New York, thus speaks of it:

"The occurrence of an epidemic of purulent opthalmia not only produces cases of partial or entire blindness, but spoils the integrity of the lining of the eyelids. This latter condition of proliferation or thickening of the conjunctiva of the eyelids, and production of so-called granulations is a most obstinate and incorrigible affection. It leads in very many cases to a life of troublesome eyes, to a cloudy cornea and imperfect sight, or ultimately ulcerations, staphyloma, and possibly destruction of one or both eyes.

"The bad effects of this preventable malady are not confined to the limited school life, but run through the entire career of the sufferer or make him a vehicle of contagion to others. I have often seen an entire family inoculated by the arrival in their midst of a case from a public institution. I have seen it carried into a community and there spread by a child discharged from such a school. It will be seen that we have not only the acute malady to deal with, but the baleful after effects, in blindness, chronic eye trouble and the spread of catarrhal eye disease in tenements and other communities. The authorities then, and those who make the reduction of the expenses of public charities the special object of their zeal should become broader students of the matters they undertake to regulate."

We are indebted to Charles J. Kipp, M.D., of Newark, for the following outline and directions as to the prevention of communicable eye diseases:

"HOW TO PREVENT THE SPREAD OF CONTAGIOUS DISEASES OF THE EYE, AND WHAT TO DO FOR THEM.

"The contagious diseases of the eye are the most destructive of eye diseases, and often lead to hopeless blindness, if they are neglected or improperly treated.

"In the vast majority of the cases the contagious disease of the eye is caught by using the towels, sponges, napkins, handkerchiefs, wash-basins or other articles used by persons afflicted with the disease, in washing or wiping their eyes; in other cases, the disease is caused by bringing the discharge from a specific disease in contact with the eyes. From this statement it will be seen that by proper precaution the spread of the disease is easily prevented.

"In order to enable our readers to form some idea of what constitutes a contagious eye disease, we will state that any affection of the eye which gives rise to the formation of much matter (discharge) may be looked upon as contagious. The most prominent symptons of the disease are a copious, thick, yellowish discharge from between the lids; swelling and redness of the eyelids, and redness of the white of the eye.

"To prevent the spread of the disease the patient should, if possible, be isolated; that is, he should have a room by himself, and no one but the nurses should be allowed to enter the room.

"A large and well-ventilated room should be selected.

"All the linen used by the patient should be washed by itself, and, if possible, should be soaked in some disinfectant solution before washing.

"All articles used for cleansing the eyes should be destroyed by burning, especially the cloths and sponges.

"The nurses attending the patient should carefully and thoroughly wash their hands in hot water and use the nail brush before leaving the sick-room, and they should never be allowed to touch any other person's eyes while in attendance on a patient suffering from such a disease as the one here described.

"If the nurse should at any time have reason to think that some of the matter from the patient's eye has got into her own, she should at once wash out the eye with plenty of clean tepid water, and consult a physician as soon as possible.

"No person afflicted with a contagious eye disease, even if it is not sufficiently severe to confine him to his room, should be allowed to go among others.

"Teachers and persons in charge of asylums, schools, &c., should not permit a child with sore eyes to attend school, or be admitted into an institution containing children, unless a competent physician has certified that the eye disease is not contagious.

"A very serious form of eye disease is sometimes developed in new-born children on the third, fourth or fifth day of life, rarely later.

"To prevent this the child's eyelids should be very thoroughly cleansed with a clean soft cloth, or a new clean sponge, immediately after birth, before it receives a bath; and after bathing, its eyes should be thoroughly washed out with clean tepid water, which may be dropped between the gently opened lids from another new and clean sponge or from an eye-dropper. For some days after this, great care should be taken that none of the sponges, napkins or other articles used for the mother are used about the child, and especially about its face.

"If, notwithstanding these precautions, the infant's eyelids begin to swell and become red, and a watery discharge makes its appearance, some days after birth, it may be assumed that the infant's eyes are in great danger, which can be averted only by placing it at once under the care of a good physician, and by faithfully carrying out the latter's directions. *In all such cases it is the imperative duty of those in charge*

of the infant to see that a competent physician is placed in charge of the case, for, if properly treated, the disease will, in all probability, pass away without damage to the sight, while if it is neglected, hopeless blindness is only too often caused by it. It is said that nearly one-half of the inmates of the schools for the blind have lost their sight from this disease. Until a physician can be obtained, the patient's eyes should be frequently cleansed in the manner above described, and all the precautions mentioned against spreading this disease should be strictly observed.

"The danger of blindness from this disease is as great in older children and grown persons as in infants, and no time should, therefore, be wasted in trying the different domestic remedies or patent eye-waters, before consulting a physician."

All cases of inflamed eyes or granular lids should receive the earliest attention.

There is also, in connection with our schools, need of more care as to the eyes. By the relation of light and shade to the room, the position of the blackboards or excessive weariness of the eye, the foundation is laid for permanent impairment of vision. Where there is short-sightedness or other defect, it should early be remedied by glasses. In the best foreign schools it is now the habit to have the eyes of children carefully examined, in order that defects may be noted, and either cured or prevented from becoming excessive.

DEAFNESS AND CONSEQUENT LOSS OF SPEECH.

An analysis of cases found in most of the deaf-mute asylums, shows that by far the larger number result from disease. Scarlet fever, by affecting the middle ear and the chain of bones therein, often causes loss of hearing and speech. Other affections of the throat or tonsils also inflame the minute tube leading from the middle ear to the throat, or so close it as to prevent the record of sound. Many of the minor inflammations of the external ear also have to do with impairment or loss of powers in the organ. In every case of scarlet fever, of diphtheria, and of mumps, there needs to be watchfulness as to the acuteness of hearing for some time after the local swelling or inflammation has subsided. Often the doctor leaves the case doing apparently well, and the impairment goes on gradually afterward. Pain in the ear, of any kind, needs early attention. Even where the middle ear is not

the seat of the trouble, the drum or septum, between the external and middle, may easily become involved from the outer side. Many of the domestic remedies for ear-ache are worse than useless. But little can be known as to the treatment of even the external ear until the canal has been examined as far as the drum.

Often where the family physician may not have all the instruments of precision for testing the acuteness of the senses, his opinion is of great service in directing to those prepared for more accurate diagnosis. It is estimated that a large percentage of those who now find their way to the public charitable institutions of the State, could be prevented from this necessity, if only the possibilities of precaution and early aid were known.

It is the design of this circular to impress the importance of such prompt and intelligent action as will save persons, families, and the State from losses which our charities seek to mitigate, but for which they cannot compensate.

E. M. HUNT, M.D.,
Secretary.

CIRCULAR XLVIII.

OF THE

NEW JERSEY STATE BOARD OF HEALTH.

TRENTON, October 1st, 1884.

G.—AS TO ANIMALS.

INFECTIOUS PNEUMO-ENTERITIS.—SWINE PLAGUE.

There is some difference of opinion as to the earliest appearance of this disease. Diseases of swine until recently were less fully classified than those of most other farm animals, and so under the names of "Anthracoid Erysipelas," "The Distemper," "Hog Cholera," "Blue Sickness," "Typhoid Fever," etc., ailments really different have been associated. At one time it was regarded as caused by a worm, the Stephanurus dentatus (See Cobbold, Fleming, White, Fletcher), which was not infrequently found, but is now known to have no causal relation.

Nusken, in his general pathology on veterinary science, (Munster and Ham, 1829,) and Spinola in his treatise on "The Diseases of the Pig," Berlin, 1842, describe symptoms which many identify as the same disease.

Dr. G. Sutton, of Aurora, Indiana, described this disease in 1858 under the head of "Swine Pestilence," in the *North American Medico-Chirurgical Review.* In the U. S. Agricultural Report of 1861, Dr. E. M. Snow, of Providence, Rhode Island, gives a detailed account of the disease, and states that it was recognized in this country in Indiana, in the summer of 1856.

Harms, (Hanover, 1869,) under the name of pig erysipelas and pig plague (pamphlet), is believed to describe this disease.

Dr. Budd, in a lecture to the members of the Royal Agricultural Society in 1865, and in his treatise on typhoid fever, speaks of it as the exact counterpart of typhoid fever in man, as does Professor Wartly Axe, of London, in *The Veterinarian*, July, 1865. They were both mistaken, as shown by Dr. Murchison and others. Roell (Wien, 1876,) follows nearly the views of Harms. If, as is probable, the disease is included in the one so often described as Anthracoid Erysipelas, according to Fleming (1875), it prevails as a "most fatal and destructive malady in Great Britain, on the Continent, and in America and Australia." In the U. S. Agricultural Report of 1878, Professor James Law accurately defines the special symptoms and gives details of autopsies made by him in Scotland. He has also since made important culture and other experiments as to it. The medical officer of health of Great Britain, in an introductory note to the report of Dr. E. Klein, V.R.S. (1877), says of the swine plague and hog cholera that "the disease is rife in all parts of England and Ireland, and it produces oftentimes great ravages among herds."

Zundel (Paris, 1874,) probably describes the same disease, as does Ballinger in *Ziemssen's Cyclopædia of Practical Medicine*, London, 1875, where he says of swine, "They are subjected to a scourge which is frequently, though falsely, reckoned as anthrax, and is indeed similar to it in many features and equally dangerous, viz., the hog plague."

Dr. J. M. Partridge, in the second annual report of the Indiana State Board of Health (1884), says:

"Swine plague, or hog cholera, undoubtedly appeared in this country as early as 1860. It was not then regarded as a contagious disease, and received no general attention or public notice until fifteen

years later, or about 1875. At this time its wide-spread proportions and fatally destructive character began to cause great consternation throughout the pork-producing regions of the Northwest, as it was estimated that the loss to the producers from this disease amounted to the enormous sum of $15,000,000 annually. In this emergency Congress appropriated $10,000 to be placed in the hands of the Commissioner of Agriculture, for the purpose of investigating diseases of domesticated animals. The Commissioner, finding that the loss of swine was greater in numbers and value than that of all other animals combined, wisely determined to expend the greater part of this appropriation for investigations in this direction. He therefore appointed an examiner in each of the seven States where this disease was most prevalent. Their examinations and reports have done great credit to the authors, and rendered most valuable service to the country."

For one of the earliest and the most thorough inquiries into the disease, we are indebted to Dr. E. Klein, F.R.S., whose valuable research and reports on its history, pathology, etc., are to be found in the Public Health Reports of the Medical Officer of England, for the years 1876 and 1877. These have been followed up by the valuable series of investigations by Detmers, Law, Salmon, and various others under the auspices of the U. S. Agricultural Department. See reports of 1875, 1877, 1878, 1879, 1880, and 1881–1882. Professor W. Osler, of Montreal, has closely studied the disease.

In the fall of 1878, H. J. Detmers, V. S., of Chicago, claimed to find a special form of bacteria, which he called "bacillus suis," which he believed to be the contagious particle. Dr. D. E. Salmon, of the Bureau of Animal Industry, Washington (Report of 1881–2), disputes the views both of Klein and Detmers as to the pathogenic agent or contagion being a bacillus, but views it as a micrococcus (page 269), found both in the glands, the blood and the tissues.

Because of the great mass of investigation and literature to be found on the subject, of which those referred to are but specimens, this Board, under the present provisions of our law, did not regard it as essential to do more as to pathological investigation of the disease than to make enough post-mortem examinations to confirm its diagnosis. As there had been sporadic cases of it in the State before, it was carefully noticed in the first circular of this Board as to contagious diseases of animals, issued in 1879. (See 4th Report.)

It is not necessary here to enumerate all the various symptoms or pathological changes which are found in various cases, but only such as are the most constant and diagnostic. Only the condition of the

lungs, the intestines, especially the large intestine, and the lymphatic glands, are constant as to post-mortem appearances. In addition the changes in the skin, in serous membranes, in the heart, the liver, the spleen and the kidney, are worthy of note.

The disease is not transmissible to men, but is, although not readily, to some of the lower animals, as the rabbit, the mouse and the sheep.

The following is mostly Klein's description of a typical case:

In the severer cases we observe constitutional and other disturbances in the living animal after an incubation period of two to five or more days. The animals do not feed well, are dull, creep into their straw, probably from a sense of feeling cold. Their skin feels hot and the body temperature is raised. This last symptom shows, however, great irregularity and variation. In some of the severer forms we find the skin of the groins, neck, inside of the thigh and perineum swollen and of a patchy or diffused redness. This redness may be absent altogether, or it may be only transitory: it may appear only for a short period at the outset, or near the fatal termination of the disease. Hæmorrhages in the red patches are occasionally seen; they lead to the formation of scabs. The red patches of the skin, at all events, are a very inconstant symptom.

In many severe cases the animals suffer from diarrhea. This may be persistent or only temporary, disappearing and coming on again. When it is of a permanent character, the animals become soon emaciated to a considerable extent.

The respiration is quick and impeded. There is often hoarseness and cough.

On post-mortem examination we find that ulceration of the ileo-cœcal valve, and especially of the colon, is very marked. In the latter we may find confluent ulcerations of great dimensions, occasionally several inches in diameter. As a rule they are round or oblong. The Peyer's glands near the ileo-cœcal valve are distinct. In the lower part of the colon we find the solitary lymph-follicles very marked, projecting more or less over the surface of the mucous membrane as nodular swellings. The mucous membrane of the large intestine and duodenium (in some cases also that of other parts of the small intestine), presents numerous small hæmorrhages. The submucous tissue of the large intestine—especially the colon—is the seat of hæmorrhages.

The lymphatic glands of the pelvis, the mesenteric glands and the glands in the porta hepatis are greatly enlarged and firm; in their interior may be seen fibrinous deposits; their peripheral parts are more or less filled with effused blood.

The spleen is occasionally enlarged, its capsule shows numerous small hæmorrhagic spots. In one case I have seen considerable number of white brittle nodular or irregularly-shaped masses in the

substance and underneath the capsule of the enlarged spleen. The liver is occasionally enlarged, full of blood; in some cases it shows hæmorrhagic spots underneath the capsule.

The peritoneum is highly inflamed, containing numerous hæmorrhagic spots; there is considerable amount of clear or more or less blood-tinged and coagulable exudation in the serous cavity. Masses of solid lymph are found on the omentum, the mesentery and the serous covering of the large intestine, which in some cases show also numerous minute false membranes. The pleura and pericardium are in most cases more or less inflamed, their cavities containing inflammatory exudation.

The lung is the seat of more or less severe lobular pneumonia; considerable portions of both lungs become airless and more or less consolidated. The trachea and bronchi contain muco-purulent matter slightly tinged with blood.

The tongue, mucous membrane of mouth and epiglottis occasionally show hæmorrhagic patches or even ulcerations.

The disease is highly infectious. By direct experiment it can be proved that the diseased lung, the contents of trachea and bronchi, the diseased intestine—particles of ulcerated mucous membrane that are discharged with the fæces—the diseased spleen and the peritoneal exudation contain the materies morbi. The disease can be produced in a healthy animal by inoculating a minute quantity of the materies morbi into the skin or mucous membrane. The disease may be induced also by mixing the materies morbi with the food. I have not been able to determine definitely, whether the fresh blood of diseased aminals when inoculated does or does not, as a rule, induce the malady. The disease can be produced by simple cohabitation with a diseased animal, or by putting a healthy animal in a place where a diseased one had been previously kept.

The eruption is not always present, and yet most look upon it as an eruptive or exanthematous disease. In severe cases it is rarely absent. There is a "uniform or patchy redness on the under part of the abdomen and on the inside of the forelegs and thighs. The eruption is in the form of small round raised spots of a papular appearance, but the minute pimples sometimes fill with a thin fluid, and so become vasicular and dry away into crusts." According to Prof. Axe the pimples are often successive to a third or fourth crop.

Klein made various culture experiments and cautiously claimed that the microphyte or "specific plant germ," found by him, differed from any other known. (See pages 169 and 217.)

A condensed and well arranged description of the disease is to be found in "The Relation of Animal Diseases to Public Health," F. G. Billings, D. V. S., New York, 1884.

The disease, when caused by inoculation, developed in from three to five days, but its period of incubation, when caught, is not very accurately known, being given as from five to fifteen days. It is communicable by contact, through the air and by articles or persons that have been in contact with the pens, &c.

"The external symptoms are a dullness of the eyes, the lids of which are kept nearer closed than in health, with an accumulation of secretion in the corners. There is hanging of the head, with lopped ears, and an inclination to hide in the litter and to lie on the belly and keep quiet. As the disease advances, the animal manifests more or less thirst, some cough, and a pink blush or rose-colored spots, and papular eruption appears on the skin, particularly on the belly, inside of the thighs and forelegs, and about the ears. There is accelerated respiration and circulation, increased action of the flanks in breathing, tucked-up abdomen, arched back, swelling of the vulva in the female as in heat; occasionally, also, of the sheath of the male, loss of appetite, and tenderness of the abdomen, sometimes persistent diarrhea, but generally obstinate constipation. In some cases large abraded spots are observed at the projecting points of the body, caused by separation and loss of the epidermis. In such cases a slight blow or friction on the skin is sufficient to produce such abrasions. In many case the eruption, blush and spots are entirely absent; petechia are formed in only about one-third of the cases. In some cases there is considerable inflammation of and discharge from the eyes. Some animals emit a very offensive odor even before death. In large herds, where the disease prevails extensively, this offensive effluvia can be detected for a great distance to the windward. In nearly all cases there is a weakness or partial paralysis of the posterior extremities, and occasionally this paralysis is so complete in the first stage of the disease as to prevent walking or standing.

"As symptoms of special diagnostic value, which are scarcely ever absent in any case, the following are mentioned: Drooping of the ears and of the head; more or less coughing; dull look of the eyes; staring appearance of the coat of hair; partial or total want of appetite for food; vitiated appetite for excrements; rapid emaciation; great debility; weak and undecided, and frequently staggering, gait; great indifference to surroundings; tendency to lie down in a dark corner, and to hide the nose and even the whole head in the bedding; the specific offensive smell, and the peculiar color of the excrements.

"If the animals are inclined to be costive, the feces are generally grayish or brownish, black in color and hard; if diarrhea is present, they are semi-fluid of a grayish-green color, and in some cases contain an admixture of blood."

The disease is not transmissible to man, although some are sickened by its odor. It is transmissible by inoculation and perhaps by contagion to some of the lower animals, as rabbits, mice and sheep, but not readily. Pigs that are kept in a filthy way, that drink polluted water, or are kept in open fields exposed to changes of weather, contract the disease when it is prevalent more readily and severely than others. It seems especially active when the grass is wet, or when animals by reason of pasturage in stubble or for other reasons have sores or scratches about the snout or body. The infection is exceedingly persistent, and while cold weather and the slaughter of so many hogs in early winter diminishes the disease, the freezing of the virulent matter does not destroy its activity (Law). While no ill results followed experiments as to the use of the salted and well-cooked meat of mild cases, as the amount of fever and the changes which have occurred in cases apparently not severe cannot be fully known, any animal at all sick should not be killed for food.

It thus appearing that the character of the disease, its symptoms, its lesions and its contagiousness are well understood, the practical question is what is to be done to check the ravages, since it is now domiciled in over thirty States, and yearly causes the loss of animals whose value counts into the millions of dollars.

I. No reputable authority claims that much is to be done for the sick swine by way of treatment. The most of these die, and if they recover are so reduced or diseased as not to be worth fattening.

II. This, however, does not at all indicate that nothing is to be done by way of *preventing* the spread of the disease. The following are the chief directions when a case occurs. *Do not remove the sick pig, but remove all the rest.* If the herd is a large one, divide it into two or three herds. Let new, temporary pens be made of entirely new boards, with new troughs, new pails, new swill, and to which or about which no one shall go who has had to do with the old pen. This course carried out *accurately and rigidly* will save most of the hogs in most of the cases. If after removal new cases occur, at once transfer them to the old pen or kill them, and if there are more than one or two cases move the hogs again. After the first case occurs,

give to each well hog, of one hundred pounds weight, three times each day, a full half teaspoonful of flowers of sulphur dissolved in milk. For those of heavier weight increase the dose in proportion.

Some good authorities claim equally good or better results from the use of ten drops of carbolic acid (full strength) to each one hundred pounds of weight, and given three times per day in solution of a half pint or pint of water.

The only other remedy suggested by a sufficient number of good authorities, is some one of the combinations of sodium with sulphurous acid known as sulphite or bisulphite of soda.

Half dram doses, three times per day in their usual food, may be given for each one hundred weight of flesh. We prefer the bisulphite in about teaspoonful doses.

You may choose either of these three named remedies and give them systematically, and see that the pig *really gets* the amount attempted to be given. The treatment should be followed up for at least two weeks.

The same treatment in double quantities for all these remedies is claimed to be of service to sick hogs as well, but full proof cannot be found. In giving such medicines to swine, it is often best to scoop out a part of a cooked potato and then plug it with part of another, and so give it to the animal, as the potato is likely to be eaten, and thus the whole amount given reaches the stomach. The scattering of fine charcoal, of sulphur, of lime, or of plaster on the boards, or more cleanly parts of the pen near the trough, may also be wise. It is not believed, however, that a pen in which a case has occurred ought to be occupied at all by the well hogs, or by any new herd, until all straw and manure have been entirely removed, all fences whitewashed, and all troughs, and pails, and swill barrels disinfected as directed in former circulars.

As the disease is no doubt often conveyed from the pens or herds of neighbors, or from running water which comes through the premises of those who have the disease, or even through the air from adjacent farms, too great care cannot be taken by any one whose herd has it, that it be not transmitted. Hogs turned out to pasture, especially before or after it is wet with dew or mild rains, seem to get it, because the wafted material is more apt to alight and remain amid moisture. There are some remarkable examples of exemptions to herds whose owners have been skilled and consistent and exact in their

precautions. Where a neighbor's herd is affected, in the opinion of most authorities it is wise to put adjacent herds on some one of the treatments named, and to use precautions as to the field exposure, as to cleanliness, and even as to change to new pens, so as to anticipate attack.

When hogs die or are killed they should be promptly buried not less than *four feet* under ground, and where other hogs will not have access for two or more years.

No hogs should be allowed to run at large, and if owners are careless, Chap. LIV., Sec. 4, Laws of 1881, provides a remedy.

As the disease is so readily transmissible, swine sent by cars or any public conveyance may so infect these as to impart the disease to other animals.

If the disease continues to show the virulency and extent shown recently in this State, and so common in portions of other States, some special powers should be given township Boards of Health acting under the directions of this Board and its veterinary assistants. Already the veterinarians, whose directions have been closely followed, attest the value of the methods suggested. It is believed that known preventive measures, faithfully carried out by owners, can prevent or much restrain the spread of the disease.

While the disease now attacks herds that are well kept, we are learning from this and other animal diseases the direct result of ill-treatment of our domestic animals.

Dr. Detmers has well said:

"The domesticated animal does not approximate the habits of his pioneer ancestor in point of cleanliness. It is the instinctive habit of the animal to bathe in water and wallow in mud to counteract heat and as a protection against flies; but in a state of nature, when the mud has served its purpose, the animal cleanses himself by friction with the nearest tree; the filthy bed which the domestic animal becomes satisfied to occupy in a state of confinement is never occupied by animals running in the forest, and given opportunity to make and change their sleeping-places at will—in short, when allowed to provide for his own existence, he exercises a more intelligent regard for his wants than is ordinarily exercised for him by his owner, who attempts to supersede instinct by reason."

Cobbold, in his "Treatise on Animal Parasites," says that "swine are not attacked by a greater variety of entozoa than other domesticated

animals." The prevalence of these and of various microphytes or "disease organisms," animal or vegetable, in animals, is usually the result of the artificial conditions established by man. We are to seek riddance from such destructive animal pests, not by finding specifics for disease, which do not exist, but by finding our way back to natural methods of dealing with animals, and so preventing those immense losses to agricultural and stock-rearing industries, which are so rapidly increasing. Thorough and enforced cleanliness for all domestic animals is for the interests of their owners, because for the welfare of the animals. Impure water, spoiled foods, poor ventilation, filth or imperfect care generally, will tell upon man or upon beast, and, unfortunately, the innocent owner must suffer with the ignorant and the careless. This and every other epizootic or enzootic prevailing among animals should lead to a careful study of the indications as to food, habits, care, and all that contributes to their most perfect health.

CIRCULAR XLIX.

OF THE

NEW JERSEY STATE BOARD OF HEALTH.

TRENTON, December 1st, 1884.

(H. AS TO ANIMALS.)

HUSK OR HOOSE AND TUBERCULOSIS IN CATTLE.

HUSKS OR HOOSE IN CATTLE.

Among the various forms of parasites that infest the lower animals, are those belonging to the nematoda (round worms.) Some of them are common to men and animals. Others are not, in any of their forms of life, transferable from the one to the other.

Cobbold says the nematodes of the ruminants (cud-chewing animals) are both numerous in and destructive to their bearers, those infesting the lungs being productive of a parasitic bronchitis, termed husk or hoose. In cattle, the lung-worm (strongylus micruris) is particularly fatal to calves, while strongylus filaria attacks sheep, and

especially lambs. A larger but less common lung strongyle (S. rufuscens) is sometimes found associated with the latter. In 1875 I conducted experiments with the view of finding the intermediate hosts of strongylus micruris, and I arrived at the conclusion that the larvæ of this parasite are passively transferred to the digestive organs of earth-worms. The growth and metamorphoses which I witnessed in strongyloid larvæ taken from earth-worms (into which I had previously introduced embryos) were remarkably rapid.

The strongylus micruris is quite similar to the strongylus filaria, the parasite found in the lungs of lambs and sheep. To the affection, as found both in lambs and in calves, the names husk or hoose, phthisis pulmonalis verminalis, and parasitic bronchitis are given. It is better, however, since the worm itself is somewhat different, to give different names. Neither should be called phthisis pulmonalis verminalis, since phthisis has come to be so exclusively applied to consumption, or wasting due to tuberculous deposit. The name "parasitic bronchitis" is the best, if a general term, applicable to all animals thus affected, is used.

The bronchial cough of the calf makes the name husk or hoose quite distinctive for it. The parasite strongylus micruris gains access to the pulmonary tissue and bronchial tubes through the circulation, the ova being absorbed from the digestive canal. The seat of the irritation is indicated by a bronchial cough, "husk or hoose," loss of flesh, a varying degree of constitutional disturbance and death by suffocation, if the sufferer is not relieved. If any mucus be coughed up and examined, the parasites may be discovered. Bronchial irritation occurring in calves during summer or autumn, should always be looked upon with suspicion, and its source thoroughly inquired into. The disease is rarely found in cows and oxen, although cases of it do occur in these. It is said to be most frequent where calves are exposed to dews and pastured on wet pasture or low, ill-drained lands, or where, in dry summers and scarcity of water, they are supplied by stagnant pools which eventually become dry. It is most common in the late summer and fall. Most of the veterinarians of the Board have had occasion to distinguish between it and pleuro-pneumonia, as it is often confounded therewith.

The treatment recommended is as follows: "The calves are to be warmly housed if the nights be cold; the affected animals are, upon all occasions, to be removed from the healthy—not that the disease is

contagious in itself, but that the parasites, or their ova, are apt to gain access in the bodies of the healthy—and, for the same reason, the healthy should be removed to fresh pasture and to dry situations, as the fields upon which the disease has prevailed will, for a time at least, be tainted by the parasites and ova." In treatment, chief reliance is placed on the inhalation of fumes, either of sulphur or chlorine, as both sulphurous acid and chlorine gas will kill the parasite. The mode of using these is the same as in the disinfection of dwellings, and the details can be given by any competent veterinarian.

Generally three or four inhalations, of fifteen minutes each day, will much limit the disease and finally cause it to disappear. Salt, turpentine, lime-water, etc., have been found useful.

"The enclosures in which the animals have been temporarily housed should be thoroughly scoured with boiling hot water impregnated with salt." The free use of commercial sulphuric acid, one pint to eight gallons of water, sprinkled over the yard and thorough whitewashing, add to the security against the recurrence of the disease.

TUBERCULOSIS IN CATTLE.

The existence of tuberculosis in animals, and especially in cattle, has long been recognized. Several circumstances have of late led to a closer inquiry as to it. The disease has seemed to be largely on the increase. Villemin and others have established its communicability, both by the exposure of animals thereto and by the test of inoculation. Fleming has given facts in support of its probable spread by infection and to show that the disease may, in exceptional circumstances, be conveyed from diseased to healthy animals.

Creighton and others claim to have shown that human and bovine tuberculosis are so nearly the same disease as to be interchangeable. Gerlach claimed, from his feeding experiments, that the flesh and milk of tuberculous animals must be excluded from human food, since by using it in its raw or half-cooked state tuberculosis is liable to be reproduced in man. The hereditary tendency of the disorder seems to be established. The possible communicability of consumption in some cases has also given a new interest to bovine tuberculosis. These various views by competent and skilled observers, even if not yet accepted as conclusive, cannot but lead to the most earnest inquiry, since the health and welfare of man and of all other animals is directly involved.

In the report of the New Jersey State Board of Health, 1881, T. B. Rogers, D.V.S., thus refers to it:

"Tuberculosis is not uncommon. In one autopsy made last spring the tubercular deposits extended to almost every tissue of the body. The first noticeable trouble in this case was mammatis, the post-mortem showing that the hardening of the mammæ was due to tubercular deposit and not to common or ordinary causes of the trouble. Practitioners, in view of this, will do well to exclude tubercle before pronouncing this affection local and harmless. Whether the milk from a tuberculous animal is fit for human food, or her flesh fit for beef, is a question which should receive grave consideration from your Board. My own opinion on this subject is very decided, and I strongly advocate the slaughter and burial of these cases wherever found."

During the last summer a series of cases came under the examination of this Board. Cases having occurred in a valuable herd in this State, it became our duty to consider whether it was to be regarded as subject to the law relating to the contagious diseases of animals. At that time, with the advice of the veterinarians in attendance, it was decided that no prohibitory action was required, but that full inquiry as to the extent and character of the malady would be desirable. As a result, it must be stated that there is a growing conviction on the part of veterinary authorities that the disease is not infrequently communicated from animal to animal; that, in some cases, both the meat and the milk may become unfit for food, and that stables in which it has occurred may become so permeated with the infection as to give it to the animals not in direct contact with the diseased ones. Within the last year, one owner in New York State of a herd of Jerseys, has been compelled, after other losses, to slaughter forty-five of his cattle. If the views of its communicability are accepted, it must be remembered that it is not claimed as a diffusive contagion, or that the meat is always unfit for use, or that the milk is harmful, unless the udder itself is diseased. The Board, however, thinks it proper to issue a circular which shall give some description of the disease, of its alleged causes, and a statement as to the precautions to be taken for its prevention, or as to herds in which it is found to exist.

"It is characterized by the deposition of tubercular matter in serous membranes, in the lungs and other organs, wasting of the tissues and other signs of imperfect or malnutrition, which lead more or less rapidly to a fatal termination; the tubercular matter undergoing various

characteristic changes, according to the length of time it has been deposited, and modifying the symptoms accordingly." (Fleming.)

Prof. Walley speaks of the serous membranes, such as the pleura and the lining membrane of the abdomen, as showing tubercular lesions oftener than any other structure.

The most usual form seen with us can be thus described: "The tubercle at first is very small, about the size of a pin's head, then that of a pea and a hazel-nut. In the course of time these become converted into small, hard, globular nodules, of the color of connective tissue; gradually, however, they become gray and somewhat translucent in sections, and constitute the so-called gray or fibrous tubercle. These gray miliary nodules may remain discreted and scattered over the surface of the membrane like millet seeds; they may become connected together by delicate bands of new connective fibrous tissue, forming the so-called grapes of England, the angleberries of Scotland; or they may become aggregated together and form immense masses, which may degenerate in particles or en masse, or they may remain fibrous.

The "grape" or "angleberry" appearance is, perhaps, better described by the German name of "perlsucht" or pearl disease. This post mortem appearance, so often seen, is very diagnostic.

Besides the serous membranes, tuberculosis of the lungs, tubercular infiltration of the lymphatic and mesenteric glands, tubercle in the liver and in the alimentary tract are not rare. Fortunately, tuberculosis of the mammary gland or udder is not so frequent as of other glands.

Where there is tubercular deposit in the digestive tract the fæces are not infrequently tinged with blood. Ulcers are found here and there. Prior to irruption of the ulcer, in chronic cases, the mucous membrane is elevated by the tuberculous nodule, which is readily distinguished by its yellow color. These nodules are found in various parts of the intestinal tract.

Tuberculosis of the lungs, when occurring in animals, has not a few of the symptoms which characterize the same disease in man. In these cases, cough is a more prominent symptom and the diagnosis from pleuro-pneumonia, especially in the chronic stages, is not always easy.

In whatever form tuberculosis attacks cattle, the animal does not thrive. With some, the symptoms are loss of appetite, scouring, and

mucous or dysenteric discharges and other symptoms of imperfect digestion. With others, the cough and uneven respiration indicate the affection of the respiratory organs. Where the lymphatic or mesenteric glands are involved, the animal will not take on flesh and remains long in an unhealthy state. Where the mammary gland is attacked, the diseased part, when cut, is apt to have a reddish hue, and the secreted milk is liable to be contaminated with the tuberculous products. In most cases the milk deteriorates in quality, if it does not diminish in quantity.

When we come to examine into the causes of tuberculosis among cattle, they are found to be very similar to those detected as to man. That it is hereditary, the discovery of the disease in calves, and its tracing in the offspring of unhealthy cattle, abundantly proves.

High breeding, and especially in-and-in-breeding, seems to favor the development of the disease. Animals ill-fed, or kept in large numbers in poorly aired apartments, are most likely to show the disease.

Cows which are abundant milkers, or which are forced in order to secure large returns, are most apt to fall victims to the malady. There is also much probability that an animal seriously affected with tuberculous disease will impart it to other susceptible animals near by. Cases enough are on record to show such transfers, and that a particular stable, or part of a stable, where cases have occurred, seems unhealthy for other animals until full disinfection has been practiced. It may not be so actively communicable as to deserve to be called contagious, as many claim that the cases in which it is communicated are exceptional. They are chiefly, if not entirely, those in which the lungs are so diseased as that the breath is full of infective particles; those in which the discharges from the bowels, as dropped upon the grass, come in contact with grazing animals, or those in which a diseased udder conveys the malady to calves.

Prof. Walley, of Edinburgh, is so pronounced in his views as to say that a tuberculous animal is "useless for breeding, dangerous for dairy purposes, valueless and dangerous as a companion, and its flesh nocuous for human food," and so claims that our whole energy should be directed, not to curing an animal, but to preventing the disease.

Prof. Williams, speaking of those cases in which the tubercular deposits have become masses, says that they are to be viewed as excrescences, and if they are carefully removed and the membranes and

structures in which they are imbedded and from which they grow are carefully dissected from them, the flesh is perfectly good. Others insist that all such flesh shall only be used after thorough cooking. The question as to the use of the milk has been made to depend much upon the condition of the udder, and upon the presence or absence of tuberculous deposit in it. This is often hard to determine until after death. It is also difficult to see how, in a cow greatly affected in the alimentary canal or in the lungs by a constitutional disease, such a secretion can remain pure. It is now believed by many physicians that the uncooked milk from tuberculous cows is a frequent cause of tuberculosis, and especially of mesenteric tuberculosis, in children.

For the prevention of tuberculous disease in animals, the following good rules are given:

"1. All flesh and offal of affected animals, especially in the advanced stages of the disease, should be destroyed.

"2. All suspected animals should be carefully isolated until pathogonomonic signs or tests have become developed.

"3. All actually affected animals should be slaughtered.

"4. All contaminated food, litter, &c., should be disinfected or burned.

"5. All infected houses should be disinfected.

"6. No animal, whose history is tainted even in the slightest degree, or in whose system there exists the least suspicion of tubercle, should be used for breeding purposes.

"7. Great care should be exercised at the period of birth to avoid any influences which will weaken the tissues in adultism.

"8. Breeding animals should be carefully shielded—as far as is practicable—against debilitating influences of any kind.

"9. The system of feeding and general management of our high-class stocks should be regulated on a more rational and conservative basis than that on which it at present rests."

The treatment of an animal suspected of tuberculosis, and yet not so affected as to be of no value, should aim at fattening. If the muscular tissues are, to all appearances, healthy, as tubercle is never, as a rule, developed in such tissue, it is not to be rejected as food simply on the fact that masses are found in the abdominal cavity, or that the lungs or glands are diseased. There seems to be stronger evidence that the uncooked milk of animals suspected of tuberculosis should not be used. Yet if there is no tubercle in the udder, there are those who still claim that the milk is not to be condemned.

The fact that tuberculosis in cattle is admitted to be largely on the increase in Europe, in Great Britain and in this country, and that it is an outcome of forced and unsanitary methods, and is especially prevalent among high-bred and pampered stock, should lead all stock raisers to a closer watchfulness over the laws of health which pertain to cattle, not less than to human kind. Pure air, pure water, cleanliness of skin, good bedding, proper food and exercise, and special attention to milch cows, is essential to the preservation of the health of herds.

NOTE.—All those circulars as to Contagious Diseases of animals, will soon be printed together, as Circular L., and can be had on application, by postal, to the State Board of Health, Trenton.

LAWS.

The chief laws relating to health passed by the Legislature of 1884 are as follows:

Chapter XXIV.—An act to provide for drainage and sewage in densely-populated districts in which there is a water-supply.

Chapter XLIX.—Supplement to an act entitled "An act to prevent the spread of glanders in horses."

Chapter XC.—A supplement to an act entitled "An act to prevent the adulteration and regulate the sale of milk."

Chapter CXXXVII.—A supplement to an act entitled "An act to limit the age and employment hours of labor of children," etc.

Chapter CLX.—A further supplement to an act entitled "An act concerning the protection of the public health."

Full references to former laws will be found in the Sixth Report, pp. 255–260, and the Seventh Report, pp. 31 and 32.

As throwing additional light on the interpretation of the health laws of this State, and upon the right and the duty of summary authority in so great an interest as the protection of the public health, we are glad to be able to furnish the text of the recent charge of Justice E. W. Scudder, of the Supreme Court, in the case of Hyers v. Cole and others:

GENTLEMEN OF THE JURY—The plaintiff in this action has brought a suit against five different parties for alleged assault upon him, followed by arrest and imprisonment in the lock-up, at Asbury Park. This, it is alleged, took place on the 14th day of September, 1883, and he claims large damages of these defendants for the injury which he has sustained at their hands. The particulars of the occurrence are given by the parties and their witnesses, and the first question for the court and jury to determine, relates to the legal rights of the Board of Health and the police of Asbury Park; their right to inspect premises, and their right to arrest for breaches of the peace.

I do not intend to examine these laws and ordinances at this time critically; it might only embarrass you in the considerations of the facts in this case. It is the duty of the court to tell the jury what the law is, and then it is the jury's duty to apply the facts to the law.

After an examination, in the short time I have had, of the charter of Asbury Park, the laws of our State relating to Health Boards, the ordinances of the commissioners or council of Asbury Park, my conclusion is, that the health officers duly appointed, as these appear to have been, under the charter and ordinances, and the laws of our State, had the right to inspect premises, houses and lands adjoining residences in that place. I do not say what further they can do under the charter and ordinances and laws, but they had the right to inspect premises that they might base upon that inspection some action for the abatement of the nuisances, if they existed. In doing this, the inspector, whoever he may be, appointed under the charter and ordinances, must act upon reasonable cause, and that seems to me is the great guard in this case. We have heard much about officers going into people's houses and examining from mere curiosity, as an abuse of private rights, but that is not the question. The question now is, whether a man acting under public authority, duly clothed with the power of the law, has a right to make an inspection where there is reasonable cause to believe a nuisance exists. Whether there is a reasonable cause or not, is, of course, a question of fact for the jury. That is the fundamental point that lies at the basis of this action, whether they had reasonable cause to believe that there was a nuisance affecting public health upon those premises, and whether they made their examination in a reasonable way.

There is another rule of law that is fundamental to these proceedings, and that is this: when an attempt is made to enter upon a man's

premises, officers must make known to him their authority, and why they are there. Any one would resent a stranger entering upon his property and examining his premises, but if he came to you saying, "I am an officer of the law; I have reason to believe, unwittingly perhaps, you have something on your premises that is injuring the health of your family and in that way may spread in the neighborhood and do harm; I am here as a public officer to make the necessary examination; here is the badge of my office, and this is my purpose." A good citizen under these circumstances should not resist the officer and say: "You have no right here," and order him off, but would say, "For the sake of my family and my neighbors, I am willing to submit and give up some of my legal rights in this matter." There are these two points, therefore, to be determined: first, whether there is reasonable cause for the examination, and second, whether he makes known to the party the reason of his official visit. The Health Board law requires that he shall wear the "health badge." Mr. Cole testifies that he had it upon him at the time he entered the plaintiff's premises. The plaintiff says he did not see anything of the kind. It may have been there, nevertheless, if he did not see it. These badges are worn on the breast, where they can readily be seen, or if the plaintiff had asked to see his badge of office, it might have been shown, but he asked for a paper, as if he expected some warrant to make the examination; but he was not bound to show him any warrant merely to make an examination; he had not come there to remove the nuisance, but he came as an inspector, as he has testified.

Another rule applicable to this case is this, that in making this inspection the officer must use no unnecessary force himself; and if he goes there with a power and purpose to examine and see whether there is anything wrong, he must go with the manner of a man who has a duty to perform, and not to insult and annoy. He must use no unnecessary force or violence. If, however, he is resisted in a fair examination of the premises, I think he may go as far as it may be necessary to overcome opposition, in order to discharge his public duty. The more perverseness there is in the man opposing him, the greater may be his reason to believe there is something wrong. The Inspector says he saw a heap of manure and it was covered with offensive matter, as he and Dr. Mitchell say, with maggots feeding upon something likely to breed disease. He went to the nearest door and found a man there who, when spoken to, flew into a rage and ordered him off the premises. It would be most natural to suspect, under these facts, that he had something to do with it. Why should a man be so indignant if he were innocent? All he had to do was to say that he had nothing to do with it, in a quiet way, and then, if the officer insisted upon an examination, in the discharge of his duty, it was his duty to answer his inquiries and submit to a proper examination. The officer could insist, in a respectful way, on seeing whether it came from his house. The question then was, whether there was reasonable cause to suspect

there was some nuisance there, and that it was traceable, according to the conduct of this man, to his own premises. He says he had been making root beer of some kind in his house. If the officer knew that, and he says he had heard it, it was natural for him to suppose that this refuse that he saw on the manure heap might come from that; although the plaintiff denied it, he was not bound to believe that, therefore he went in to make the inspection.

Now, so far, in looking at the ordinances, the laws and the charter, I think there was power, at least, for the officer to inspect those premises if he had a reasonable cause to believe that there was a nuisance of some kind there, likely to breed disease. You will find in the charter of 1874 quite a general power. It says: "The said commissioners (that is, the governing body of Asbury Park,) shall have power to appoint a police justice and police officers sufficient for the preservation of order, and determine the compensation they shall receive, and to suppress any nuisance, to make and enforce all necessary sanitary regulations." That is a very general power. They can "make and enforce all necessary sanitary regulations;" that is, regulations necessary to preserve the good health of that borough. The act of 1880, which has been referred to, says: "The Board of Health of any city, borough, incorporated town or township, shall examine into all nuisances, foul or noxious odors, gases or vapors, or causes of ill health or disease that may be known to them." The Board of Health may examine into all nuisances that may be known to them. They of course may make inspection; they may appoint officers to examine; it is not to be supposed that the Board itself is to examine all parts of the town; they appoint their proper officers to do it, and in this case they appointed health inspectors. In that way the Board of Health examined into all nuisances as all official bodies do. They act by committees and special officers, who are delegated to certain ministerial duties, and so the Board of Health, in this case, although they did not all go to examine these premises, yet, acting under this law and their ordinances, they had appointed health inspectors to examine into all nuisances. "The Board of Health shall examine into all nuisances that may be known to them or be certified to them," the law says. As this officer passed along the street, or the alley, he noticed this place, he says; he was an officer of the Board, not a mere intruder, or stranger, and he was acting for the Board and by their authority; he was looking into this matter and beginning to make his inquiries about it. And so as to other particulars, in going through the laws, although they are somewhat confused, the general conclusion that I have reached is that the inspector had the right to examine and see whether there was a nuisance upon the premises. The question for you is, whether he exercised that right properly. It is said that the officer must find the owner, or the occupant of the property, where it exists. Well, accept that as the law, was not the plaintiff in this case the occupant of those premises? He occupied a portion of the building in front of this land where the manure-heap

was found, and, finding the door open, the inspector went to make inquiry. He may be said to be the occupant, as far as the public are concerned. There may have been other occupants, having the right to use this yard for certain purposes, but the inquiry was addressed to a proper person. At the first visit made by Mr. Cole, finding what he says, he entered or attempted to enter the house when the door was open, saw the plaintiff, and made his inquiry of him. The plaintiff said he had nothing to do with it; that it belonged to others, and it ended in his ordering the officer to go away from the house. Mr. Cole says at that conversation he used some pretty high language in reference to the Board of Health, as to their authority to come there. After Mr. Cole left, he went to the president of the Board. One of the ordinances of 1880, which has been read, authorizes the president to act, when the Board is not in session, and between their meetings he has the power to give orders. He did not convene the Board, and you can see that could not conveniently be done; to call all the members together whenever there was a case directly in view under inspection would nullify the whole law. The Board had given authority to the president to act between their meetings, and this inspector went to the president, who, by the ordinance of 1880, was acting for the Board when not in session. The president of the Board went with him to this place. They testified that they went together and examined the place where it was alleged this difficulty was found. You have heard the testimony of Dr. Mitchell of what he found there. After this examination, they went to the house and there saw the plaintiff; and Dr. Mitchell testifies, and Mr. Cole also, that they spoke to him of the nature of this offensive matter, and offered, if he would furnish a barrel, that they would have it removed. That was the first remedy they proposed. He refused to do anything, according to their evidence, and that induced Dr. Mitchell to make further examination, and in looking around the house he found some indications that induced him to believe that the origin of this trouble was in the house. He may have been mistaken about that, but as I have said, you are to say whether they were acting upon probable cause in making this examination and in going to this house. He testifies that he saw upon the ground near the house indications of something that was not right—something offensive and that led him to desire an admittance to the house. You will recollect also that these officers, acting as they did, had this further cause to believe there was something wrong, and that the plaintiff was the origin or cause of it, because Mr. Cole testified that in his first interview with Mr. Hyers he told him that he threw this offal out there himself. This is denied by Mr. Hyers, and it is not said that upon their second visit he made any such admission; it stands, therefore, upon Mr. Cole's testimony alone. If that be true, and these officers went there with that knowledge, they had some cause, at least, to look to him and to his premises for the reason. The cause might be, as has been intimated, the man-

ufacture of beer or something of that kind inside, which the plaintiff now admits that he was doing. He says that it was root-beer, that he got the ingredients from New York and there was no offensive refuse from it. If that fact was known to these officers and they saw this offal outside, was it a reasonable cause for them to examine the premises? The president, Dr. Mitchell, says they told him who they were and the purpose of their visit, but he resisted and objected to any examination being made; flatly denied that he had anything to do with this offal outside and stood upon his rights; said his house was his and nobody could go into it. If that be so, then we might as well abolish all Boards of Health. If a man's contradiction is to stand against an officer's inspection of what they see and what they say he admitted; if his refusal is to stand in opposition to the law, our Boards of Health can act upon nothing except what can be seen outside the house. The great cause of disease may be inside a man's dwelling and he may be utterly unconscious of it, and if the officers come to him, stating their purpose in a peaceable way, and ask leave to make their examination, I doubt very much whether his house, under those circumstances, can be considered his castle, when the law, in express terms, authorizes an examination to be made. They entered his house, as they say, and began the examination; he objected to it; of course we must assume that, from all they say. He says distinctly that he told them to go out, when they came in the house; and then his version is that they got hold of him and took him out; that he demanded a paper authorizing them to make the search, and they said they had none. He says they used violence, and all that he did was to hold back; but he did not strike them or resist them in any way, except by holding back. When he was outside he says that Mr. Cole threw him down and held him there until these other defendants came and took him off to the lock-up.

On the other hand, the statement is this: That Dr. Mitchell and Mr. Cole entered the house for the purpose of making an inspection based on what they had seen outside, and that Mr. Cole went upon one side of the room to make an examination into a barrel, and while the doctor was looking upon the other side of the room, and as Mr. Cole was stooping over the barrel, he saw the plaintiff, Mr. Hyers, strike Mr. Cole violently on the side of the head with his fist, and, as he recovered from it, kicked him in a painful part of his person. If this statement be true and believed by you (and Mr. Cole and Dr. Mitchell say it is so), whether these defendants had any right to these premises or not, he is guilty of an assault and battery for which they had a right to arrest him. There is no law in this State that justifies a man in striking and kicking a person who is a mere trespasser upon his land. It is greater force than is necessary under the circumstances. Your first right is to order a trespasser off your lands. If he refuses, and resists and strikes you, you may strike him back—using just as much force as is necessary to resist force—and remove

him from your premises. Admitting that these gentlemen had no right there, but Mr. Cole and Dr. Mitchell had mistaken their duty and went outside of the ordinances and laws, and that they came into the man's house when he did not want them there, he could order them out, but he had no right to strike Mr. Cole as he did—he became a trespasser himself in doing so and committed an assault and battery. It is your province, not mine, to weigh this testimony. He says he did not strike them at all, but they dragged him out. They say when he committed this assault, Dr. Mitchell said to Mr. Cole, "Arrest him," and he, being also a police officer of Asbury Park, did so. If he was a peace officer, acting as such, he had a right to make the arrest when he saw the assault committed, without a warrant. Dr. Mitchell testifies as to the resistance he made and the difficulty Mr. Cole had in keeping him; that he went to Mr. Bailey, the chief of police, and Mr. Buchanon, the chief commissioner of the borough, for assistance. If a man resists an arrest by an officer having authority to make it, others may assist him when called on. It is the duty of all good citizens to aid a police officer in making an arrest and in discharging his duty to the public. The persons who are joined as defendants in this case are Mr. Cole, Dr. Mitchell, Mr. Buchanon, the commissioner, Mr. Bailey, the chief of police, and Mr. Buckalew, who was a police officer and called upon by the chief of the police to assist in making the arrest, who assert that they were justified by the resistance of the plaintiff. It is also testified that the plaintiff attempted an escape during the time they were trying to arrest him. He, it is said, asked permission to go in his house in order to put away some of his property, and after he had entered he locked the door. He says himself that he went in and locked the door and they came in after him. Mr. Buckalew, the constable, was ordered by the chief of police to re-arrest him, and he broke in the door, or forced it open, as he had a perfect right to do, if the plaintiff was attempting to escape. A man cannot shut his door, when arrested for crime, in the face of a public officer and put him at defiance. He may break in the house to make a criminal arrest. This was done, according to the evidence, by Buckalew, who entered the house and with help took the plaintiff to the lock-up. No magistrate being found immediately, he was put in a safe place until they found one; then he was examined, and after examination bail was taken for his appearance to answer for the offence. A man under arrest is entitled to a speedy examination so it can be determined by the proper magistrate whether he has committed a crime that will justify holding him to bail. The nearest magistrate, it is said, was found without unnecessary delay; the examination took place and he was admitted to bail.

The testimony of the respective parties is conflicting. The plaintiff insists that here has been an outrageous violation of his rights by coming into his house, arresting him and locking him up without legal cause. On the other side it is claimed that they were acting in

the interest of the public, the enforcement of the laws of the Board of Health, and the whole difficulty arose from the plaintiff's unlawful resistance, the violence of his attack upon Mr. Cole, and that was the cause of their subsequent treatment of him in locking him up in the public place kept for that purpose.

The great importance of this question, of course, is in construing the power of the health officers under the charter, laws and ordinances, which is a question of law; the manner in which they execute them is a question for the jury, depending on the facts of the case. We are not to speculate on other cases, but ascertain what was done in this case by these particular parties. It is said that it is a great outrage to private rights if a man's house is searched by public officers, appointed by the law, without warrant or accusation of crime. This power, when lawfully exercised, is based on and justified by the law of public necessity and it is part of the police power of our State, sometimes exercised when it becomes necessary to deal summarily with abuses and dangers for great public ends. In case of fire, houses are not only entered but they are blown up and destroyed to stop the spread of a great conflagration—that the whole town or city may not be burned down and hundreds rendered homeless and impoverished. When great ends are to be accomplished for the public safety and for public health, the Legislature sometimes delegates part of the police power of the State to municipal bodies or selected persons, whose right is undoubted, provided they act in accordance with the law and in a fair and reasonable manner. If the acts complained of were done by these defendants in an arbitrary way, by asserting their authority because they happened to be officers of the borough, and overpowering and oppressing the plaintiff without legal excuse, then they should be punished; but if, on the other hand, they used a reasonable discretion and acted as prudent men in the discharge of their duty, there is no liability at all; they should be commended rather than condemned. These are the principal points of the case which are submitted to you, and I will allow the counsel any exception to the construction which has been put upon the law and the ordinances.

The jury found the defendants not guilty.

MEDICAL REGISTRY.

The seventh report of this Board, 1883, contained a list of all names returned to us of medical practitioners in this State, who had registered in the clerk's office of their respective counties, under "An act to regulate the practice of medicine and surgery, approved March 12th, 1881, and the supplement thereto," approved March 22d, 1883. By this act no person is allowed to practice medicine or surgery in this State in any of their branches for gain, or to receive or accept any fee or reward, directly or indirectly, unless having the title of M. D., and having recorded a diploma, or, in case of twenty years' practice, a certificate thereof, in the office of the county clerk of the county. This large registry is to be found in the seventh report. The list herewith given is the addition sent by each county clerk of the registries since the last report, with the addition of a few who have requested a correction of some error in the former list. Especially in Camden county list, Pennsylvania University is sometimes confounded with University of Pennsylvania. While the whole list cannot be repeated each year, effort is made to obtain knowledge of all local changes. The lists furnished this year are as follows:

ATLANTIC COUNTY.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
North, James	Hammonton	——— —, '68	Jefferson Med. College, Phila.
Parkhurst, G. H		Mar. 3, '60	
Way, Jacob H	Atlantic City	Mar. 12, '75	Hahneman College, Phila
Nivison, Mrs. S. S	Hammonton	Mar. 10, '85	Female Med. College, Phila.
Marvel, Philip	Atlantic City	May 1, '84	University of Penna., Phila
Elmer, Ulrich	Egg Harbor City.	Feb 24, '83	University of France.
West, Maximilian	Atlantic City	Mar. 12, '75	University of Penna., Phila
Merritt, David		Mar. 6, '51	Penna. Col. of Gettysburg.

BERGEN COUNTY.

NAME OF PHYSICIAN.	P. O ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Adams, Charles Francis	Hackensack	Mar. —, '84	N. Y. Hom. College, N Y.City.
Ballard, James J	Tenafly	Mar. 9, '82	University of N.Y., N Y.City.
DeYoe, Charles P	Ramsey	Mar. 15, '83	Maryland Acad'y, Baltimore.
Howard, C I	Lyndhurst	Mar. 4, '84	Col of Phy. and Surg. of Md.
Parsell, Lewis B	Closter	June 14, '81	L. I College, Brooklyn, N.Y.
Terry, J. Wadsworth	Englewood	July 30, '62	Yale College, N. Haven Conn.

BURLINGTON COUNTY.

Beegle, Isaac N. Fitch	Ocean Grove	Mar. 1, '70	Bellevue Hospital, N. Y.
Brown, Richard E	Mount Holly	Mar. 10, '63	Jefferson Med College, Phila
Campbell, Robert A	Burlington	Mar. 12, '75	St. Louis Medical College.
*Haines, A C	Columbus	Mar. 8, '80	
Harker, Charles		Mar 29, '84	Jefferson Med College, Phila.
Jones, Gilbert Eli	Mount Holly	Nov. —, '71	Dartmouth College, America.
Jenkins, Mozart		July 6, '84	University of Vermont.
Jackson, Moses Jose		—— —, '84	Eclectic College.
Kollock, M. Henry		Feb. 21, '69	University of Pennsylvania
Tolson, B. Franklin	Masonville	Mar. 9, '72	Jefferson Med. College, Phila.
Walo, I Byers		Mar. 29, '84	Jefferson Med. College, Phila
Young, D Irene		Mar. 7, '48	Pennsylvania College, Phila

* In the case of A. C. Haines, the register gives date of filing 1880, but diploma cannot be found.

CAMDEN COUNTY.

Wills, Joseph H		Mar. 15, '80	Pennsylvania University.
Archibald, Henry C			Pennsylvania University.
Shafer, William			Jefferson College.
Theis, Wilhelm		Mar. 10, '77	Jefferson College.
Townsend, E. P		Mar. 10, '63	Jefferson College.
Wells, Jesses J			Jefferson College.
Marvel, Philip			Pennsylvania University.
Diekel, John G		June 25, '69	Eclectic College.
Raughley, Gulielnum			University of Pennsylvania.
Finlaw, James P		Mar. 3, '84	Electric Med. College, N. Y.
Somerville, G H			Hahneman College

CAPE MAY COUNTY.

Patterson, Austin H	Ocean City	Mar. 1, '73	University of the City of N.Y.
Gardiner, William H	Philadelphia, Pa.	Mar. 10, '79	Hahneman Med Col of Phila.
Kirkpatrick, Andrew B.	Cape May Point	Mar. 29, '84	Jefferson Med. Col., Phila., Pa.

CUMBERLAND COUNTY.

NAME OF PHYSICIAN.	P. O ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Ayars, Sherman Edwin..	1113 Girard St., Phila.	Mar. 3, '84	Eclectic Med. Col, N.Y. City.
Adams, O. H.	Vineland	Nov. 13, '83	Dartmouth College.
Bidwell, Edwin C	Vineland	Jan. 20, '44	Yale College, N. Haven, Conn.
Bidwell, Edwin H.	Vineland	Apr. 3, '83	University of Penna., Phila.
Brewer, Charles	Vineland	Mar. 6, '55	University of Md., Baltimore.
Harris, George M.	Dorchester	Mar. —, '81	Eclectic Med. Col. of N. Y.
Jones, Eli G.	Bridgeton	Nov. 1, '71	Dartmouth College, N. H.
Wilson, Howard A.	Deerfield	Mar. 29, '84	Jefferson Med. Col., of Phila.
Wade, John W.	Millville	Mar. 29, '84	Jefferson Med Col, of Phila.
Moore, John H	Bridgeton	Mar. 15, '80	University of Penna., Phila.

ESSEX COUNTY.

Crane, Jr., Matthias		Feb. 27, '78	Columbus Col. of Med, Ohio
Carroll, William E.		May 13, '84	Columbia Col. of Med. and Surg.
Duffy, Charles J.		May 13, '83	Columbia College.
Dewey, Raphael Pelham.		June 20, '70	Philadelphia College.
Everitt, Edward		Mar. —, '79	N. Y. Hom. Med Col.
Harrington, Rich. Chas.		Mar. 13, '84	Bellevue Hos. Med. Col., N.Y.
Johnson, Jotham Clark.		Sept. 21, '82	Col. of Phy. and Surg., N.Y.
Jones, Eli Goellet		Nov. 1, '71	Dartmouth Med. Col, N. H.
Mueller, Edward		Aug. —, '83	Med. Society of New Jersey.
Newman, Emanuel D.		Sept. 30, '84	Col. of Phy. and Surg., N. Y.
Phelan, Thomas Francis.		Mar. —, '82	Bellevue Hos. Med. Col., N.Y.
Roth, Jr., Philip		July 9, '81	University of Vermont.
Snyder, Mrs. A.		— —, '83	University of Leipzig.
Sealy, Edward		Mar. 13, '84	Bellevue Hos. Med. Col.
Sleght, Berier Has. B		Mar. 14, '82	Hahneman Med. Col., Phila.
Van Busker, Roswell		Jan. 8, '84	Affidavit of 20 years' practice.
Wright, Benjamin M.		Oct. —, '69	Hosocamii Ins. Lan. College.

GLOUCESTER COUNTY.

Philips, Cyrus B.		Mar. 1, '82	Academy of Maryland.
Weeks, Charles B.	Mantua	Mar. 30, '83	Jefferson Medical College.
Currie, Margaret	Bridgeport		United States Med. College.
Tuller, Malcolm B	Woodbury	Mar. 10, '73	Hahneman Med. Col., Phila.
Beckman, Oswald H	Clarkston	Mar. 29, '84	Jefferson Med. College, Phila.
Speakman, Howard D.	Woodbury	Mar 1, '—	University of Penn., Phila.

HUDSON COUNTY.

Adam, Clovis		Mar. 1, '77	Columbia College, N. Y.
Baker, Jane M.		Mar. 11, '82	Eclectic Med. Col. of N. Y.
Briggs, James E.		Feb. 4, '75	Eclectic Med. Col. of N. Y.
Brown, Cecelia A		Mar. 8, '82	Hom. Med. College, N. Y.
Cornell, G. B.		Mar. 4, '64	University of City of N Y.
Carpenter, B. D.		— —, '46	University of City of N. Y.

HUDSON COUNTY—Continued.

NAME OF PHYSICIAN.	P. O ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Corwin, Fred. Miller		Mar. 8, '81	University of City of N. Y.
Drain, John S.		Mar. 5, '84	University of City of N. Y
Durzowski, Henry W.		Mar. 6, '79	Eclectic Med. Col. of N. Y
Darlington, Wm. L.		Mar. 11, '75	Jefferson Med. Col., Phila
Freeman, Aurry		Mar. 13, '84	Bellevue Hosp Med. College.
Finnerty, John Henry		Mar. 13, '84	Bellevue Hosp Med. College.
Finch, R. G. D.		Mar. 8, '81	University of City of N Y.
Hopper, C. Percy		Mar. 15, '83	Hom. Med. Col., N. Y City.
Hoegelsberger, H.		Mar. 5, '84	University of City of N. Y.
Healy, Dennis J		Mar. 13, '80	University of City of N Y.
Jackel, Charles E		Mar. 13, '84	Hom Med. College, N. Y.
Jones, Wm. Fred.		July 7, '83	University of Vermont.
Loomis, Albert J.		Sept. 1, '84	Bellevue Hosp. Med College.
Luck, John T		Feb. 28, '68	Columbia College, N Y
Lutz, Fred H.		Mar. 16, '82	Hom. Med. College, N Y
Majonka, Eleanor		Jan. 23, '80	Danzig Inst of Midwifery.
McKenzie, Wm. V.		May 13, '84	University of Pennsylvania.
Pindar, John		April 4, '53	University of Pennsylvania.
Russell, Jr, Wm. H		Mar. 10, '77	University of City of N Y.
Reed, John W.		July 9, '84	University of Vermont
Rosenkrans, James H.		Mar. 14, '83	Bellevue Hosp. Med. College.
Rhodes, T. C.		Mar. 9, '65	University of City of N. Y.
Schmidt, Frederick		Aug.—, '70	Acad. of Geo. Augustus, Ger.
Senderling, P. M.		Mar. 9, '56	University of Pennsylvania.
Tompkins, Abraham W.		Mar. 1, '83	Eclectic Med Col. of N Y.
Van Derback, John		July 20, '66	Griefswold Univ., Prussia.
Wilkinson, James		Oct. 14, '58	University State of N. Y
Warden, Albert W.		Mar. 13, '80	University of City of N. Y.
Warke, D.		Mar. 9, '65	University of City of N Y.
Wilkinson, George		July 15, '83	Bellevue Hosp. Med College.
Youlin, J. J.		Mar. 1, '54	Hom. Med. Col, Cleveland.
Yarnall, J. H		Mar. 1, '83	Eclectic Med. Col of N Y.

HUNTERDON COUNTY.

Funey, William F.	Frenchtown	Mar. 12, '74	University of Penna., Phila.
Anderson, J. E.	Stanton	Mar. 4, '84	Col of Phys. and Surg., Balt.
Warrington, C. B.	Clinton	Mar. 5, '60	University of Penna., Phila.

MERCER COUNTY.

Sands, Oscar Gilbert			Bellevue Hosp. Med. Col.
Schicht, Emilie		Aug. 29, '68	Karl Ferdinands Univ. in Konegreiche Bohmen.
Wetherill, Horace G.	Trenton, N. J.		University of Pennsylvania.

MIDDLESEX COUNTY.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Applegate, Grover T......	New Brunswick...	Mar., '83	Hahneman Med.Col.Chicago.
Baldwin, Abram V. N....	New Brunswick...	Mar. 16, '82	Col. of Phys. and Surg., N. Y.
Carroll, Edgar.	....	Mar. 10, '80	Jefferson Med. Col., Penna.
Dewey, Raphael P........	(Traveling Phys.)	June 20, '70	Eclectic Med. Col., Penna.
Davis, Francis A...........	Spotswood..........	Mar. 1, '71	Bellevue Med. College, N. Y.
Davis, Edwin T............	Sayreville	Mar. 14, '82	Hahneman Med. Col., Phila.
Janeway, Thomas L......	New Brunswick...	Mar. 12, '67	Col. Phys. and Surg., N. Y.
Jones, Eli Grellett..........	(Traveling Phys.)	Nov. 1, '71	Dartmouth Medical College.
Leonard, Franklin A.....	Milltown............	July 9, '84	University of Vermont.
Lewis, Smith H............	South Amboy......	Mar. 14, '81	University of Pennsylvania.
Snyder, S. M...............	Spotswood..........	Mar. 11, '64	University of Pennsylvania.

MONMOUTH COUNTY.

Andrew, Russell G.........	Navesink............	Jan. 9, '66	Col. of Medicine, of Albany.
Bennett, Henry A.........	....	Sep. —, '83	University of Vermont.
Barr, David M..............	Ocean Grove........	Mar. 10, '84	Jefferson College, Pa.
Christine, William B......	Asbury Park........	Mar. 12, '77	University of Pennsylvania.
Cooper, James E............	Colts Neck.	Mar. 12, '67	Columbia College.
Curtis, D. Farquhar	Long Branch......	Mar. 10, '81	Columbia College.
Disbrow, Stephen M.......	Farmingdale.......	Nov. 13, '66	Columbia College.
Ford, Edward J....	Asbury Park.......	Mar. 1, '60	Col. of Phys. and Surg., N. Y.
Follett, William M.........	....	Mar. 1, '83	Eclectic Med. College, N. Y.
Higgins, Archibald A.....	Manasquan.........	Apr. 1, '54	University of Pennsylvania.
Hepburn, G M	Freehold	Mar. 10, '80	University of Pennsylvania.
Haines, Alfred C...........	....	Mar. 31, '43	University of Pennsylvania.
Jones, Eli G..................	....	Nov. 1, '71	Dartmouth College.
Johnson, William E.......	....	Feb. 22, '66	Cincinnati College.
Johnson, William M......	....	June 30, '81	University of Michigan.
Kent, William...............	....	June 6, '37	Collegii Hosocomii, Brooklyn
Kirkbride, M. Frank......	....	Mar. 22, '74	University of Pennsylvania.
Lytle, Richard Ridgeley..	....	June 28, '77	University of Virginia.
Leonard, F. A..	....	July 9, '80	Univ. of Vermont Agr. Col.
Morris, Henry...............	....	Mar. 12, '78	Jefferson College, Pa
Nagle, J. E	... ...	June 16, '52	University of Vermont.
Pumyea, Peter B...........	Allentown	Mar. 1, '68	Bellevue Medical College.
Rankin, E. G................	....	——, '78	New York Medical College.
Socarras, de Rodolfo.......	....	Mar. 15, '82	Bellevue Hosp. Med. Col.
Slocum Sidney T...........	Asbury Park	July 16, '84	New Jersey State Dent. Soc.
Urie, William A............	....	Mar. 10, '79	Electropathic Inst., Phila.
Vansant, Eugene L........	....	Mar. 29, '84	Jefferson College, Phila.
Woodman, Johannum.....	....	Mar. 15, '83	Columbia College.
Wainwright, James B.....	Manasquan.........	Mar. 1, '77	Columbia College.

MORRIS COUNTY.

Ayers, Daniel S............	Rockaway..........	Mar. 2, '70	Columbia College, N. Y. City.
Ayers, J. S..................	Madison	Mar. 15, '83	Hom. Med. College, N. Y.
Bright, Leonard............	Woodport...........	....	University of Vermont.
Dodge, H. N...............	Morristown.........	Feb. —, '68	Columbia College, N. Y.
Parker, W. Thornton......	Morristown.........	....	....
Reid, S. H..................	Madison	——, '81	Columbia College, N. Y.
Salmon, Johanna	Boonton	Sept. 13, '79	Prov. Nurs'y Inst., Germany.
Simon, Charles I...........	Boonton	——, '79	Columbia College, N. Y.
Woodruff, Marietta C.....	Boonton	Sept. 29, '75	N. Y. Free Med. Col. Women.

OCEAN COUNTY.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Badger, Merritt O.	Manchester	July 9, '81	Univ Urbis Neo Eboraci.
Bradford, T. Hewson	Berkeley	Mar. 3, '74	Collegii Jeffersoniensis.
Bennett, Henry Allyn	Point Pleasant	....	Collegii Agricultural
Huntsinger, Edward	Toms River	Oct. 16, '68	University of Pennsylvania.
Taylor, John M	Beach Haven	Oct 7, —	University of Pennsylvania.

PASSAIC COUNTY.

Griffiths, John L	Paterson	June 9, '84	University of Vermont.
Joussett, Albert D	Paterson	Mar. 14, '83	Bellevue Hosp., Med Col.
Millspaugh, Lewis C	Paterson	Mar. 5, '84	Univ. of the City of N. Y.
Millspaugh, Daniel T	Paterson	Mar. 5, '84	Univ. of the City of N. Y
Van Riper, Cornelius	Passaic	Mar 8, '66	Col. of Phys and Surg., N.Y.

SALEM COUNTY.

Currie, Margaretta H	Woodstown	Mar. 6, '81	U. S. Medical College.
Jones, Eli Grellet	Salem	Nov. 1, '71	Dartmouth Medical College, Hanover, N. H
Robinson, C. M.	Elmer	Mar 16, '62	University of Pennsylvania.

SOMERSET COUNTY.

Cooley, Justus H		Mar. 3, '84	Eclectic Medical Col., N. Y.
Jackson, Moses J		Mar. 1, '84	Eclectic Medical Col., N. Y.
Searle, Wellington B		Feb. 28, '72	Col of Phys. and Surg., N. Y.
Hoagland, Garret G		Mar. 9, '84	Jefferson College, Phila., Pa.
West, Heston R		Mar. 19, '84	Hahneman Med. Col., Ill.
Voorhies, Amidee F		Apr. 7, '54	The Medical Society of N. J.
Stelle, Ephraimum M	Bernardsville	May 18, '84	Col. of Phys. and Surg. N. Y.

SUSSEX COUNTY.

Beers, Francis	Flatbrookville	Mar. 12, '81	Jeffersonian College, Penna.
Condit, Arthur W	Andover	June 29, '82	University of Michigan.
De Leon, Edwin	Orange Co., N. Y.	Oct. 17, '77	Eclec Med. Soc State of N Y.
Huston, O. P.	Flatbrookville	June 27, '78	University of Michigan.

UNION COUNTY.

NAME OF PHYSICIAN.	P. O ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Armstrong, George A.....	Elizabeth	—— —, '84	Univ. of the City of N. Y.
Bull, Charles G	Plainfield	Mar. 10, '81	Bellevue Hosp. Med. Col.
Bachelor, H. M............	Summit	—— —, '77	University of New York.
Davis, Thomas S...........	....	Apr. 2, '84	Hahneman Med. Col., Phila.
Donovan, Alfred Q........	Elizabeth	Mar. 25, '82	Bellevue Medical College.
Griffin, J. F.................	Plainfield	....	....
Gale, William...............	Westfield......	June 26, '67	Long Island Col. Hosp.
Hedges, Elias Walton....	Plainfield	Apr. 13, '83	University of Pennsylvania.
Jones, Eli Grellet..........	Elizabeth	Nov. 1, '71	Dartmouth Col., N. H.
Oliver, Allen H............	Elizabeth	Mar. 25, '82	University of Pennsylvania.
Stites, Joseph Augustus...	Linden	Mar. 1, '75	Bellevue Med. Col, N. Y.
Ulmer, Henrietta Young.	Elizabeth	July 3, '84	College of Midwifery, N. Y.
Wheeler, James Albert...	Elizabeth	Mar. 13, '84	Hom. Col. of Med., N. Y. City.
Wilson, Norton L.........	Roselle	Mar. 13, '84	Bellevue Hosp Med. Col.
Walker, John Evans......	Elizabeth	—— —, '84	University of New York.

WARREN COUNTY.

Bowers, Jeremiah K......	Washington.........	—— —, '73	American Univ. of Penna.
Bergen, E. J................	Hope	—— —, '77	University of New York.
Deacon, T. Eayre.	Phillipsburg	—— —, '84	Hahneman Med. Col, Phila.
Linaberry, Wm. L.	Allamuchy	—— —, '83	Col Phys. and Surg., Chicago.
Roberts, D. Edgar.........	....	—— —, '83	Univ. of the City of N. Y.
Stiger, J. D..................	Delaware	—— —, '84	Col. of Phys. and Surg., Md.
West, Heston R............	Phillipsbnrg	—— —, '84	Hahneman M. Col., Chicago.

REPORT

OF THE

BUREAU OF VITAL STATISTICS

OF THE

STATE OF NEW JERSEY

FOR THE

Statistical Year from July 1st, 1883, to July 1st, 1884,

WITH ADDITIONAL QUINQUENNIAL TABLES AND CLIMATOLOGY.

DEPARTMENT OF STATE.

TO HON. HENRY C. KELSEY, SECRETARY OF STATE.

By EZRA M. HUNT, M.D., Sc.D.,
Medical Superintendent of Vital Statistics.

INTRODUCTION TO THE REPORT ON VITAL STATISTICS.

The importance of vital statistics is so well recognized by all who understand their bearing, that it is now seldom necessary to explain the work begun in this State in 1838, and rendered more complete by recent laws.

Since political economy, social science and the study of population have come to be recognized as very essential factors of prosperity, not a few are getting closer insight into the work. It is a great concern of the State whether a proper guard is placed upon the conditions of marriage, whether the evidence of parents' consent to minors, of the reality of the ceremony, and of the competency of the parties to the contract, are established. The family is the essential unit of the State, because it is of all society. On it depends more for the State than upon any other of its institutions. The English requirement of notice of marriage, and the plans still adopted in some of the States and in the District of Columbia, did not arise from inquisitive officiousness, but from what both reason and experience had taught as to the concern which the State has in properly-considered and attested marriages. It is believed that the influence of the method of the Society of Friends and of our early laws on this subject has been very salutary, and help to account for the fact that the grounds for divorce and its frequency are not so commonplace in this State as in many others. The marriage certificate now furnished has, in addition to the blank, a certificate which the parties may be asked to sign, and which not only is valuable as a defense to the person performing the ceremony, but is also a proper guard to the parties.

The record of deaths not only serves to identify, but is the mildest form of certificate that the life of a human being has ceased and that there has been proper care exercised as to it. So long as one of the chief objects for which the State exists is the protection of human life,

such certificates are not incidental but essential to a proper conduct of social and civic administration. We have constant evidence of the salutary influence which the system has exerted upon that oversight of human life and its perils, which cannot be too carefully impressed upon citizens. Strange as it may seem, very many incline to be careless in the protection of life. The flagrant case which occurred in this State during the past year, as to the burial of twenty or more infants, is but an illustration of how far an act of great impropriety may take place without that reflection which is due to the sacredness of life and to the relation which each life bears to the State.

As the incident of birth is none the less real in its civic relations than that of marriage or death, and as we also need to know the age and character of the material on which the forces of disease are acting, this record comes in as essential to the other two.

As to all, it may now be said that we know of no one who has made a study of political and social economy, who does not realize that, for social as well as for legal purposes, there should be this uniform method of collecting the statistics so as to make them not only accessible but comparable with each other for statistical and sanitary purposes. While one who works in such a field has great reason for humility, by reason of the imperfections realized, yet he also has great reason for encouragement, since the imperfections decrease, and, even with them, the greatest guides and lights of social and sanitary progress have realized and exhibited their essential value.

The only rare and incidental friction that occurs is from the fact that an occasional physician or undertaker claims that he is rendering a service for which the State should award him some compensation. The first plea is that the State has no right to require this service of him, since it should be asked, if at all, from the family in which the death has occurred or from the parent of the child born.

The answer which other countries or States have seen fit to give to this is, that there are reciprocal duties always growing out of the relations between a government and its people, and that, in its supreme right, the State must decide from whom certain duties are to be asked and what duties these shall be. If it decides that, for the social and political welfare of the State, it is necessary that the State should have the information, it makes its own choice as to who shall impart it. Thus it asks of the head of the family the facts as to a census, or of

the farmer the number of sheep or cattle he has, while it passes by the teacher and does not ask the number of pupils in his district but gets the information in another way. It selects the person or persons from whom it is likely to get the most correct information, and that is always some person having essential relation to the case. If the State has the right to call on anybody, it has the right to make this choice. The fact of payment or non-payment does not determine the right of the State to exact the service, for, if the State has no right to command this and other services of a citizen because of his special relations and capacity for correct information, it has no right to make him impart the information because of the proffer of pay.

If, however, it is claimed that the State should offer compensation, the reply is:

1st. That the State necessarily requires many duties of its citizens for which they get compensation in a general way, and for which it does not give specific remuneration. It sends out its census blanks or property blanks, and proffers no pay for their infilling. It requires reports of business and incomes, if it deems such returns to be needful. It summons persons on jury without attempt at any adequate pay for their time. It compels able-bodied men, if called out by an officer, to aid him in arrest, if no police force is at hand, and detains innocent persons as witnesses, if the public good requires it. The law imposes many duties on citizens and classes of citizens without direct compensation, where such duties are not burdensome or where they grow out of the special relations the individual has come to bear to society or to the State. It is, of course, important that these duties should not be unduly multiplied, or that no one person should have exacted from him a variety of such special duties. But when it is remembered that professional life practically excuses the physician from all jury duty, and recognizes him as an expert to a degree that allows him some compensation for services rendered, it can scarcely be claimed that the requisition as to these returns is burdensome.

It is to be remembered that the laws as to vaccination, as well as the general guard over births and deaths, results in emoluments to the profession at large. Even the right to practice medicine at all in a State is not a right inherent to the individual, but has to do so intimately with the health of the people that it has always been regarded as special in its character.

So readily has the right of States to require these returns to be

made been conceded by the medical profession, that we know of but one case that has ever reached the Supreme Court, viz., the case of the State of Iowa *v.* D. M. Hamilton (1882). The opinion of the court was given by Justice Beck, and on this point is as follows:

"The statute requires the collection of statistics pertaining to the population of the State and the health of the people, which may impart information useful in the enactment of laws and valuable to science and the medical profession, to whom the people will look for remedies for disease and for means tending to preserve health. *The objects of the statute* are within the authority of the State, and may be attained in the exercise of its police power. Similar objects are contemplated by States requiring a census."

The same principles of law are well stated by Dorman B. Eaton, Esq., now of the Civil Service Commission, in an article on "Sanitary Legislation in England" (New York, 1872). Also, in a paper by O. W. Wight, M.D., counselor-at-law, Detroit (A. P. H. Asso., 1882); in an article by Thomas M. Cooley, LL. D., of the Supreme Court of Michigan, on "What can the law do for the health of the people?" and in the case of the State of West Virginia *v.* F. M. Dent, before the Supreme Court (Justice Green), as decided November 1st, 1884.

"If a legislature saw fit to make it a condition that practitioners of medicine should not practice without a stated license, for which they should pay a fee, they might do so, or they may make the simple and easier condition that they shall give certificates of death or birth, and be registered as physicians." The court, in the case of Bradley *v.* N. Y. & N. H. R. R. Co., 21 Conn. 306, plainly enunciates the principle which covers all these cases: "It is universally understood to be one of the implied and necessary conditions upon which men enter into society and form governments, that sacrifices must sometimes be required of individuals for the general benefit of the community for which they have no rightful claim to specific compensation." Our State has shown that it has not the least tendency to be exacting in this regard by the terms of the law as to certificates of marriage, birth and death. In cases where a Board of Health, on account of threatening contagion, sees fit also to require for a time a report of contagious diseases, it allows adequate compensation, and thus draws the line between a vital event and the incidents of sickness.

Formerly, it was required of ministers to register marriages in the

county clerk's office of the county of their residence, and to pay one shilling for the registry. The law has now been made the same for them as it is for physicians and undertakers.

But one complaint has reached us the last year—from a physician—who, while intelligent in other matters, plainly shows that he has not given the same deliberate study to political economy or to the reciprocal relations of the State and the citizen, that he has to the more technical and business study of his profession. We have greatly to thank the medical profession of the State for the earnestness with which, as a body, it has responded to the efforts in behalf of public health, and believe that the State documents on the subject, which are mailed to all physicians, have aided in developing this interest. It is one of the satisfactions of this service that we are so often able to answer the inquiries of physicians or to direct them to sources of exact information on topics concerning the physical welfare of the people.

On the part of ministers, justices of the peace and others who perform marriage ceremonies, the returns are mostly satisfactory. It is very important that no marriage should escape record. Small books are now provided, similar to those for death and birth record, which can be carried in the pocket when needed, while the stub serves to keep that record which needs to be retained by the person officiating. These prepared books can be had by ministers and physicians instead of the blanks in stub, by applying to the city registrar or assessor, or by a postal directed to this office.

REMARKS ON SOME OF THE SEMI-DECENNIAL TABLES OF THIS AND THE FORMER REPORT,

WITH A RECORD OF THE NATIONALITY OF THOSE MARRIED IN THE STATE.

The seventh annual report of the State Board of Health contains the fifth report of the medical superintendent of vital statistics, under the re-organized method of securing returns. In connection with it is given a condensed statement of certain facts as to marriages, births and deaths for the five years ending June 30th, 1843. Also the climatology of New Jersey for the same period, as registered at seven representative localities in the State.

A table as to marriages which could not be completed in time for the former report, is also contained in this report.

The design has been so to group figures for the last five years as to give a larger aggregate of vital facts as to our population. It is not possible to state all the vital facts as to every marriage, birth or death that occurs, since, in some cases, they are not known or given, and in others supplemental reports were too late to be analyzed with the others. But this does not affect the series of facts collected as to the large numbers, about which statistics in full have been furnished since. If a sufficiently large number of data, reaching over a sufficiently large number of years, are secured, it is safe to infer that what has been found true of many tens of thousands through a series of years, would also be equally true of any small fraction thereof, whose record has not been reported or secured.

While the yearly returns of marriages, births and deaths are of much value as considered yearly, yet it is always to be remembered that the general health of any locality is never to be inferred from the record of a single year; generally the population is not large enough

to make full deductions. This is especially true of all precincts having less population than ten thousand. Also, there may be temporary and incidental causes at work, or the outbreak of some sudden pestilence has caused the unusual mortality. Even as to marriages and births, accidental circumstances may give a variation from a usual standard for a single year. It is because the laws of nature are uniform, that when studied in their entirety and with large aggregations of facts and figures, errors balance each other or become such very minute decimals in the general calculation that the result of vital statistics have been found to afford safe guides as to sanitary conditions. We do not mean by this that tables for single years are not valuable. Where there is a variation from the usual semi-decennial or decimal death-rate, there is always need of inquiry to see if the variation can be accounted for. It is very desirable, too, that cities should not merely consider the bulk of their vital statistics, but that, as to marriages and births, they should consider these as occurring in native or in foreign populations, or amid different classes and occupations. As to deaths, that is an imperfectly governed city that cannot tell each house where a death has occurred for the last decade or more; what was the sickness; what the age and nationality of the person deceased, as also the ascertained or probable cause of sicknesses or deaths in that house, if the disease was a local or communicable one. Thus, even so soon as a single year, and sometimes in a single week, where there has been a sudden increase in the number of deaths, immediate attention has been so attracted thereto as that causes have been discovered and abated.

The quinquennial table, page 379 of the seventh report, gives a very near comparative estimate of vital conditions in the several counties and cities traversed. While returns are a little more dilatory in some sections than in others and there may be a few more supplements in one than in the other, the proportion is so very small as not even by partial fractions to disturb the comparison. As to births it can not be claimed that they furnish so approximate a return of the real facts as do marriages and deaths. While the proportion for the State for five years is 21.47 as against 19.63 of deaths, the real number is claimed to be much greater. We may take the cities of Paterson and Orange as a fair estimate of what the more complete returns are for cities. We find that the returns of these for the last five years are: Orange, 2,103 to a population of 13,207; Paterson, 7,145 to a population of 51,031. This gives a birth-rate for Orange of 27.66,

and for Paterson of 28, per 1,000. The birth-rate in twenty-eight large English towns (of an estimated population of eight and one-quarter millions of persons), for December, January and February of 1883–4, was 31.7, 34.9 and 35.3 per 1,000 respectively.

The brith-rate of the whole kingdom for the year 1882 is given as 33.7.

There are some reasons for believing that the birth-rate of this country is lower than that of England. Thus the birth-rate for Massachusetts for 1883 is 23.82 to 1,000 of estimated population.

Rhode Island, whose system of registration is quite complete, gives for 1882 a birth-rate of 24.7 per 1,000, which is a little ahead of its general average. Providence, with a population of 119,405, had for 1883 a birth-rate of 24.42 per 1,000. While our record for the last five years gave an average of 21.47 per 1,000, as the returns have shown, a yearly increase, and as a delay in returns makes the percentage less than it really is, 22 may be stated as the average return for the State.

As is usual, the returns for cities exceed those for the country, although in the operation of our State law, by reason of the fact that assessors can collect births in townships in addition to physicians, the returns from townships are more complete.

A comparison of the returns as to sex shows the prevalence of the same law found elsewhere, viz.: that, as if to make up for the greater exposures of men in their occupations, the number of males born exceed the number of females. Thus of those as to whom the vital facts are given, on page 384 of the last report, 59,998 were males and 56,736 were females.

In our returns effort has been made also to secure a record of the number of previous children, and of the number actually living at the time the birth return was made.

In an aggregate of 337,163 children it is thus found that 257,343 only were living, thus showing that 77,820 had died while the parents were still in the child-bearing period. Adding to these the number of 7,195 dying just at the period of birth, we have a loss of 87,000 children. With all the sentimentality about the survival of the fittest, it is nevertheless true that the material resources of a country are best when the vigor of stock or the conditions of living and of surroundings are such as to greatly diminish this loss. If the average deaths among horses or cattle equalled this, we should, as a mere economic

consideration, have large provision made by the government to ascertain the cause of so chronic a mortality. As we come to study the death tables, we shall find that children, beyond all others, perish from preventable diseases, and that their proportionate loss is a fair indication as to the presence of those ailments which also destroy the larger proportion of the adult population who die before fifty years of age. The extremes can also be shown by the comparison of the aggregate of cities of over five thousand with the population of the State outside of cities, as also by comparing cities with such rural counties as have few if any cities.

The number of children born in the five years, as to whom the facts are stated, is 116,734. The number of native fathers is 74,844, and of native mothers 81,120. The number of foreign fathers is 40,058, and of foreign mothers 33,971. While the State has a large foreign population, this seems to show that the native stock is not dying out. The 14,876 of mixed parentage is also to be considered as adding to native stock, since where one parent is native and the other has adopted the State as a home, the influence is generally that of more rapid assimilation to the customs and manners of the people. It is evident that the native-born Jerseymen cling to their State with more tenacity than is shown in New England and in most western populations, as there is no large emigration from the other States to this State.

It is noticeable, however, that the actual number of children born is small in proportion to the number of families represented. For the sum of native and foreign fathers is 114,902, and of native and foreign mothers 115,091—allowing for some double marriages, for some where the facts as to only one parentage are given, and for some omissions of return as to the number of children. When we note 121,408 children returned as born (116,736 having the actual facts given), with 7,195 still-births, we find that we come short of an average of two children born in every five years. This would be an average of six for families as a whole for the whole child-bearing period, which extends to about thirty years. Whatever raises the average birth-rate of children born in wedlock, for parents living in the State and whose surroundings are such as are favorable to health, also furnishes a real increase of productive resources to the State. It is a marvelous and instructive study of history to see how some kingdoms and some rulers have recognized this; also, to see how prosperous periods have

been marked by a fair increase, while periods of financial calamity or social degradation result in national burden or national extinction because of the decrease of population.

The greatest calamity of Rome was the lowness of its birth-rate and the highness of its death-rate.

The statistics of this State are as yet not sufficiently numerous or complete for us to arrive at more than approximate conclusions. But the progress of the last five years clearly shows that it is feasible for us to study even what facts we have by the light of those expectations of natural life and prosperity which can be calculated from older nations, and thus arrive at some indices as to the promotion of marriage, of family homes and of surroundings favorable to the rearing of native-born, industrious and educated citizens. For it is out of such conditions that nationality grows and that national existence and prosperity are assured. Patriotism and true thrift are fostered by such oversight.

As only 2,846 colored children are reported as born for the five years, it is shown that these form a very small proportion of our population. As a rule, they are not under such favorable circumstances as most of the white races. The large demands of our summer resorts and other influences, are likely to retain many colored families in the State, and good attention should be given to their education and industrial occupation.

MARRIAGES.

The marriage-rate for the State for the five years, as given in the last report, is 15.10 to every 1,000 persons living. Inasmuch as the first year the system of registration had not become familiar to all, and as there are, no doubt, occasional failures of return, this is something below the actual proportion. The fact that divorces are less common in New Jersey than in the other States, also adds to the significance of the marriage record. That for Rhode Island for 1882 was 18.33 for each 1,000 of population; that of Massachusetts being 18.60. The rate in England for 1882 was 15.5 persons married to 1,000 persons living.

The study of occupations is, in this country, much more difficult than in foreign tables, because persons so often do not have any trade, or if they have one, change the occupation during life. We therefore have preferred to take the given occupation of the person at the time

of marriage as given by himself, rather than to rely upon the one named in the death certificate.

In a synopsis of 39,219 marriages, as to which such particulars are given, we find as follows:

Cultivators of ground	7,226
Water employes	1,263
Railroad employes	1,361
Laborers	4,758
Bakers	387
Barbers	319
Blacksmiths	659
Brewers	124
Bricklayers	71
Butchers	641
Cabinet makers	115
Carpenters and joiners	1,467
Carriage makers	124
Cigar makers	300
Clergymen	179
Clerks and book-keepers	2,910
Coopers	90
Dentists	72
Druggists	210
Editors	47
Furnacemen	9
Glass makers	364
Grocers	386
Harness makers	145
Hatters	620
Innkeepers	304
Jewelers	356
Lawyers	271
Machinists	1,074
Manufacturers	277
Masons	343
Millers	176
Painters	742
Photographers	86
Physicians	276
Plumbers	166
Police and watchmen	93
Potters	273
Printers	339
Restaurant keepers	77
Shoemakers	561
Stationers	22
Stone cutters	131
Surveyors and civil engineers	87
Tailors	307
Tanners	118
Teachers	241
Telegraphers	199
Tobacconists	58
Weavers	857
Wheelwrights	97
Workers in wool, silk and cotton	460
Other trades	5,860
Merchants	2,101
Total	39,219

Cultivators of the ground outnumber any other occupation, which shows how agriculture, in some form, maintains its prominence as a chosen industry of our people. This is the more noticeable, since one-half of our population live in cities of over 5,000 inhabitants.

It is worthy of note how well the trades are distributed, and, at the marriageable age of young life, we have a fair share of carpenters, (1,467), machinists (1074) and other trades. Masons and bricklayers number 414, which is small for so large a city population, although many take up the business afterward. 1,361 railroad employes and 1,263 water employes, married, also stand for a large number engaged

in these avocations. 2,910 married clerks and book-keepers shows a mercantile constituency constantly increasing. The marriage of 620 hatters, 364 glass-workers, 273 potters and 357 weavers, is also an indication as to these industries. Also, the localities and concentrations of industries are there shown. Thus, of the hatters married, 550 resided in Essex county. Of the glass-workers, 189 in Cumberland, 276 in Gloucester county; of the potters, 237 in Mercer county, and of the weavers, 192 in Passaic county.

Yet there are other industries that are well distributed throughout the State. It is hoped that the time will come when well-endowed industrial schools will aid in the work of the various mechanical industries, and so enlarge the sphere in which there are so many indications for great extension. It will be understood that the numbers here given do not represent the actual number now engaged in these various occupations in the State, as very many pursue these industries who were not married in the State. But it is an indication of what are the chief and chosen occupations of those who were reared in the State, or at an early age made it their home.

The tables as to nationality, which are published in the present report, but relate to the records to July 1st, 1883, also furnish the facts herewith given.

The first column of figures stands for those born in the United States; the second for a parentage in which one of the parents was native; the third for Irish; the fourth for Germans, and the fifth for all other countries.

SUMMARY OF MARRIAGES.

	U. S.	U. S., in part.	Irish.	German.	Other Foreign.
Atlantic county, 1878–79	90	8	2	16	8
1879–80	84	2	6	13	6
1880–81	67	3	......	19	4
1881–82	67	7	1	12	3
1882–83	64	2	......	18	4
	372	17	9	78	25
Atlantic City, 1880–81	14	6	......	1	2
1881–82	32	2	3	2	5
1882–83	49	1	......	5	5
	95	9	3	8	12
Bergen county, 1878–79	131	9	18	20	21
1879–80	117	6	9	31	24
1880–81	131	5	9	20	20
1881–82	124	10	9	41	31
1882–83	97	6	12	35	14
	600	36	57	147	110
Burlington county, 1878–79	206	17	8	8	16
1879–80	232	11	9	6	9
1880–81	219	15	10	13	8
1881–82	221	9	13	8	10
1882–83	220	7	7	20	8
	1,098	59	47	55	51
Bordentown, 1878–79	32	2	8	1	4
1879–80	36	1	8	1	......
1880–81	24	......	8	2	......
1881–82	34	2	7	2	1
1882–83	40	1	10	5	2
	166	6	41	11	7
Burlington city, 1878–79	61	......	2	......	2
1879–80	43	......	8	......	6
1880–81	33	4	4	2	2
1881–82	53	4	3	1	3
1882–83	43	2	6	......	1
	233	10	23	3	14
Camden county, 1878–79	69	6	2	10	2
1879–80	88	5	3	7	6
1880–81	84	1	......	2	3
1881–82	48	4	2	4	2
1882–83	66	......	......	5	1
	355	16	7	28	14

SUMMARY OF MARRIAGES.—Continued.

	U. S.	U. S., in part.	Irish.	German.	Other Foreign.
Camden city, 1878–79	212	41	21	23	25
1879–80	280	21	35	28	36
1880–81	286	15	25	38	18
1881–82	327	19	18	35	31
1882–83	323	14	24	37	36
	1,428	110	123	161	146
Gloucester City, 1878–79	13	1	12	2	......
1879–80	19	3	14	1	4
1880–81	18	1	7	2	2
1881–82	17	2	12	1	6
1882–83	21	3	5	1	10
	88	10	50	7	22
Cape May county, 1878–79	78	8	1	1	2
1879–80	74	3	1	......	1
1880–81	58	2	1	3	1
1881–82	54	2	2	......	1
1882–83	48	2	......	......	1
	312	17	5	4	6
Cumberland county, 1878–79	114	4	......	1	5
1879–80	120	6	2	4	7
1880–81	132	......	3	......	2
1881–82	141	4	3	2	6
1882–83	125	2	1	5	12
	632	16	9	12	32
Bridgeton city, 1878–79	73	4	......	4	......
1879–80	112	1	2	5	3
1880–81	81	2	1	4	3
1881–82	98	2	2	8	4
1882–83	71	5	1	7	2
	435	14	6	28	12
Millville, 1878–78	51	5	......	......	2
1879–80	71	6	5	3	......
1880–81	52	5	4	3	2
1881–82	88	1	6	2	2
1882–83	58	2	4	1	4
	320	19	19	9	10
Essex county, 1878–79	77	14	38	18	19
1879–80	84	9	43	16	21
1880–81	71	9	37	17	16
(East Orange)	59	3	3	6	20
1881–82	111	15	36	28	30
1882–83	86	8	41	20	31
	488	58	198	105	137

SUMMARY OF MARRIAGES.—Continued.

	U. S.	U. S., in part.	Irish.	German.	Other Foreign.
Newark, 1878–79	257	34	149	341	124
1879–80	276	51	145	418	151
1880–81	328	62	147	510	172
1881–82	365	58	147	574	182
1882–83	320	54	130	623	144
	1,546	259	718	2,466	774
Orange, 1878–79	24	3	47	6	9
1879–80	32	3	48	18	9
1880–81	31	2	35	8	14
1881–82	28	6	52	23	10
1882–83	35	5	46	17	15
	150	19	228	72	57
Gloucester county, 1878–79	128	13	9	11	6
1879–80	133	5	7	7	15
1880–81	148	4	7	12	9
1881–82	141	2	8	10	5
1882–83	130	3	15	9	5
	680	27	46	49	40
Hudson county, 1878–79	11	1	3	10	11
1879–80	12	6	4	16	6
1880–81	9	3	4	20	8
1881–82	10	5	14	22	9
1882–83	14	4	12	29	27
	56	19	37	97	61
Bayonne, 1878–79	6	......	1	4	3
1879–80	11	1	13	9	7
1880–81	21	5	23	7	7
1881–82	21	4	23	15	9
1882–83	15	2	23	7	6
	74	12	83	42	32
Harrison, 1878–79	3	2	7	1	4
1879–80	4	......	10	1	4
1880–81	9	1	14	1	5
1881–82	......	4	17	1	3
1882–83	8	1	15	1	4
	24	8	63	5	20
Hoboken, 1878–79	40	5	5	70	69
1879–80	37	6	13	77	60
1880–81	26	6	21	113	53
1881–82	39	4	59	127	87
1882–83	39	12	50	113	70
	181	33	148	500	339

SUMMARY OF MARRIAGES.—Continued.

	U. S.	U. S., in part.	Irish.	German.	Other Foreign.
Jersey City, 1878–79	161	32	85	127	100
1879–80	242	42	127	162	127
1880–81	251	53	124	181	137
1881–82	279	51	142	218	154
1882–83	269	59	133	261	141
	1,202	237	611	949	659
Town of Union, 1878–79	......	......	1	28	5
1879–80	3	......	1	42	2
1880–81	2	......	......	42	4
1881–82	6	3	1	48	12
1882–83	3	1	......	69	6
	14	4	3	229	29
Hunterdon county, 1878–79	249	......	14	5	5
1879–80	244	4	17	4	6
1880–81	232	2	6	4	5
1881–82	218	3	8	5	7
1882–83	235	4	8	3	5
	1,178	13	53	21	28
Mercer county, 1878–79	113	5	16	9	8
1879–80	122	3	12	13	11
1880–81	117	8	14	11	8
1881–82	99	2	7	2	9
1882–83	78	6	9	3	6
	529	24	58	38	42
*Chambersburg, 1878–79	......	......	......	......	......
1879–80	......	......	......	......	......
1880–81	......	......	......	......	......
1881–82	9	1	1	5	11
1882–83	19	2	6	11	8
	28	3	7	16	19
Trenton, 1878–79	134	19	38	29	38
1879–80	156	10	57	42	44
1880–81	168	12	37	38	53
1881–82	175	18	55	40	47
1882–83	183	16	46	42	46
	816	75	233	191	228
Middlesex county, 1878–79	98	7	2	19	14
1879–80	125	7	17	15	11
1880–81	120	8	12	10	16
1881–82	132	5	23	22	56
1882–83	136	15	26	28	55
	611	42	80	94	152

*Included in Trenton.

SUMMARY OF MARRIAGES.—Continued.

	U. S.	U. S., in part.	Irish.	German.	Other Foreign.
New Brunswick, 1878–79	69	11	6	13	6
1879–80	70	5	13	17	7
1880–81	70	4	27	25	10
1881–82	89	8	30	27	17
1882–83	56	10	43	26	13
	354	38	119	108	53
Monmouth county, 1878–79	299	24	24	4	18
1879–80	360	18	39	11	18
1880–81	362	16	33	10	23
1881–82	344	15	34	17	15
1882–83	377	18	34	19	29
	1,742	91	164	61	103
Morris county, 1878–79	144	4	23	13	26
1879–80	176	11	22	9	45
1880–81	188	11	26	7	40
1881–82	168	13	34	7	49
1882–83	188	8	27	13	50
	864	47	132	49	210
Morristown, 1878–79	29	1	1	4	2
1879–80	22	5	3	1	3
1880–81	29	1	2	4	5
1881–82	21	4	3	......	4
1882–83	25	1	12	1	7
	126	12	21	10	21
Ocean county, 1878–79	68	1	2	2	2
1879–80	91	6	2	......	3
1880–81	83	......	1	2	3
1881–82	79	......	......	1	1
1882–83	96	2	2	2	2
	417	9	7	7	11
Passaic county, 1878–79	52	5	5	2	21
1879–80	69	2	4	2	9
1880–81	70	1	3	1	3
1881–82	59	2	5	......	7
1882–83	55	4	......	1	8
	305	14	17	6	48
Passaic City, 1878–79	......	......	......	......	......
1879–80	14	3	12	3	13
1880–81	20	2	22	6	15
1881–82	21	2	15	2	29
1882–83	18	2	13	7	23
	73	9	62	18	80

SUMMARY OF MARRIAGES.—Continued.

	U. S.	U. S., in part.	Irish.	German.	Other Foreign.
Paterson, 1878–79	93	22	53	39	116
1879–80	139	19	48	54	154
1880–81	153	41	50	53	213
1881–82	153	31	64	50	244
1882–83	140	24	76	46	238
	675	137	291	242	965
Salem county, 1878–79	155	6	......	4	5
1879–80	145	4	1	4	5
1880–81	92	2	3	8	2
1881–82	88	2	2	3	5
1882–83	96	......	2	1	1
	576	14	8	20	18
Salem city, 1878–79	......	......	......	......	......
1879–80	......	......	......	......	......
1880–81	32	2	3	1	1
1881–82	39	1	4	......	3
1882–83	47	1	2	......	......
	118	4	9	1	4
Somerset county, 1878–79	112	5	13	14	7
1879–80	117	7	11	14	11
1880–81	135	3	12	18	11
1881–82	114	3	15	18	12
1882–83	115	6	16	14	8
	593	24	67	78	49
Sussex county, 1878–79	149	3	1	2	8
1879–80	149	6	1	4	8
1880–81	131	2	5	......	7
1881–82	158	4	5	5	9
1882–83	173	3	3	3	7
	760	18	15	14	39
Union county, 1878–79	25	......	5	2	3
1879–80	32	4	3	5	11
1880–81	23	5	5	4	11
1881–82	31	......	1	6	4
1882–83	37	2	4	5	3
	148	11	18	22	32
Elizabeth, 1878–79	54	10	43	40	19
1879–80	72	10	21	33	19
1880–81	85	11	56	38	28
1881–82	73	13	70	50	45
1882–83	81	9	53	48	26
	365	53	246	209	137

SUMMARY OF MARRIAGES.—Continued.

	U. S.	U. S., in part.	Irish.	German.	Other Foreign.
Plainfield, 1878–79	14	1	4	......	1
1879–80	40	1	5	6	7
1880–81	34	3	2	4	5
1881–82	45	4	5	5	13
1882–83	32	1	10	4	6
	165	9	26	19	32
Rahway, 1878–79	27	2	7	13	7
1879–80	34	4	6	9	4
1880–81	29	5	2	7	9
1881–82	31	2	5	7	5
1882–83	25	2	7	9	10
	146	15	27	45	35
Warren county, 1878–79	194	6	7	9	4
1879–80	173	6	6	7	8
1880–81	184	3	13	4	13
1881–82	1[illegible]0	7	6	6	15
1882–83	190	7	8	5	12
	891	29	40	31	52
Philipsburg, 1878–79	30	3	11	4	2
1879–80	46	......	3	2	4
1880–81	54	4	6	4	5
1881–82	53	1	4	4	2
1882–83	69	2	1	8	2
	252	10	25	22	15

CLIMATOLOGY.

In a State which presents such a diversity of soil, of climate and of altitude as our own, the study of climate as related to disease is most important. The relation, too, of the long extent of sea-coast and the diverse character of our rivers and lakes, cannot be too carefully considered. Practitioners of medicine who are located in one section for a score of years, come to know much as to these local influences. They are often able, within the area of their own ridings, to point out the effects of geological strata or drift of rivers, ponds or the soil of water-level, of winds and of hills, woods and valleys, and so to estimate how to secure changes of climate without distant removal. We ask such to carefully study these tables of climate as related to disease, and in correspondence to add the results of their own observations. In the report of last year space did not permit a completion of the tables relating to the five years from July 1st, 1878, to July 1st, 1883. These will be added after the tables of this year, and will thus be available for reference and study. This report and the last will thus furnish a condensed weather table for five years. In reference, especially, to respiratory and malarial diseases, we think the careful student will be able to trace important differences in different localities of the State. We call attention to former articles in the reports on climatology, as these have so supplemented each other as to be an aid to the student. Our reports are mostly from the localities before chosen. On account of the removal of Mr. Richardson from Freehold, we have not a complete report therefrom. We miss, too, the accustomed hand of Hon. Wm. A. Whitehead, deceased, whose labors are of such value to all students of climatology, and especially to those in this State. We are indebted to the following observers:

I. Newton, Miss E. Foster.
II. Paterson, Wm. Furgason.
III. Newark, Arthur Ward, M.D.
IV. New Brunswick, P. V. Spader, Esq.
V. Freehold, ——— ———.
VI. Vineland, John Ingram, M.D.
VII. Barnegat and Cape May, U. S. Signal Service.
VIII. Sandy Hook, U. S. Signal Service.

The tables of New York and Philadelphia are accessible for comparison. We may mention Lakewood, Atlantic City and Cape May as having shown advantages of winter climate that have been carefully recognized by many physicians and invalids. In summer not alone at our seaside, but also amid the hills of Morris, Sussex and Warren, and at some of the small lakes, there are found very desirable resorts.

METEOROLOGICAL SUMMARY OF VARIOUS STATIONS FROM JULY 1st, 1883, TO JULY 1st, 1884.

STATION, DENNIS LIBRARY, NEWTON, N. J.

Latitude, 41° 2′ 45″ N.; Longitude, 2° 19′ 48″ E. Height of Barometer Cistern above Sea Level, 660 feet.

OBSERVER, MISS E. FOSTER

	Barometer Reduced to 32°.			Thermometer.															
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Humidity.	Prevailing Wind.	Rain (Inches).*	Snow (Inches).	Days when Precipitation equaled 0.01.	Cloudy Days.	Rain-fall on days.	Thunder and Lightning on Days	Snow-fall on Days	Fog.	Hail.	Frost.	Lunar Halos.
1883.																			
July	29.476	28.985	29.210	96.7	49.3	74.02	68.00	S. W.	4.00	....	14	3	14	14	...	3	1	...	...
August	29.557	29.003	29.299	90.2	46.3	69.12	61.36	S. W., N. E.	1.43	....	6	6	7	3	...	2	...	2	2
September	29.693	28.686	29.332	82.0	38.0	60.73	64.91	S.W., N. E.	2.85	....	8	10	10	3	...	2	...	5	3
October	29.875	28.656	29.404	80.2	28.9	50.86	66.15	N. E.	6.645	....	11	13	13	1	..	5	...	6	4
November	29.779	28.691	29.357	69.3	17.7	43.41	60.63	S. W.	1.665	trace.	11	10	11	......	4	4	...	4	3
December	29.880	28.707	29.636	59.0	0.0	31.22	66.60	S.W., N.W.	3.306	22.5	16	11	9	......	8	3	...	7	5
1884.																			
January	29.996	28.336	29.308	46.2	6.0	23.58	69.66	S.W., N. E.	4.31	20.0	14	18	7	......	9	1	...	17	...
February	29.890	28.481	29.241	55.6	1.0	33.51	73.36	N. E., S. W.	4.635	14.0	16	15	15	......	4	9	...	3	1
March	29.655	28.765	29.236	62.9	2.7	36.00	69.15	N. E.	4.33	6.3	16	12	12	1	5	2	1	6	2
April	29.394	28.435	29.051	76.5	29.6	48.10	59.72	N. W	2.29	4.5	8	8	7	1	3	...	...	6	4
May	29.510	28.826	29.186	92.5	36.8	60.89	58.21	S. W., N.W.	3.42	....	15	6	16	6	...	3	...	2	...
June	29.741	28.951	29.329	97.9	42.5	71.97	65.00	S.W., N. E.	2.37	....	5	4	7	2	...	3	...	3	...
For the year	29.703	28.727	29.307	75.75	24.81	50.28	65.23	S. W.	41.251	67.5	140	113	128	31	36	37	2	61	24
Extremes	29.996	28.336	....	97.9	0.0	......	......	....	......	......	....	....	....	......	...	...	...	...	...

* Including melted snow.

REMARKS.—1883, July—Frequent thunder showers occurring at night. Precipitation above the average. Duration less than one-half that of July, 1882. There were two days of entire cloudiness. Rheumatism, pneumonia and typhoid fever appeared during the month. August—Average temperature low, the mean of the maxima being 4.5° below the average for August. No rain from 2d to 16th. Heavy dews. From 7th to 12th, winds were from points S. E. and N. E. During that period, a severe form of influenza appeared among families living near the low, wet meadows which lie northeast of the town. Frost on 27th. Scarcity of water in wells. Diphtheria prevalent at close of the month. Autumn, 1883, was nearly 1.7° below the average. Rain-fall deficient in September and November. First killing frost on October 6th. Ground frozen. Intermittent fever appeared. The northwest winds of November were frequent and disagreeable. Epidemic rose-rash appeared in the early part of the month. December was mild until the 16th. Then ten days of snow and rain, which left 10 inches of snow on the ground at the close of the month. The temperature on the 23d did not rise above zero the entire day. Remittent fever, fatal. The low mean humidity of the six months, July to December, is greatly in contrast with the corresponding period of 1882, which shows 80 per cent., all of the months having a higher mean. The general health of the community has been good. 1884, January—Daily range of temperature was normal; monthly range was 8° below the average. The month was steadily cold. Ground covered with snow and ice 31 days. Dysentery appeared in latter half of the month. February—Frequent fogs and mists. There were 171 hours of precipitation. Cellars flooded from the 15th to the 29th. Temperature of 29th unprecedented, average for the day being 64°. Rheumatism and deafness prevalent. Winter, 1883-84, was 1.69° above the average. March—Memorable for the ice-storm of the 8th and 9th. Trees covered with ice five days. No abrupt changes in temperature until during the gale of 29th and 30th, there was a fall of 40° in 12 hours, temperature remaining below the freezing-point 24 hours. Cellars were flooded from 19th to the close of the month. Catarrhal fever and rheumatism appeared. April—Cold, icy winds; low humidity. Scarlatina and diphtheria prevalent. May—First half wet and foggy. Ice formed on the 29th. June had a wider daily range than any of a series of seven years. Low night temperature. Rain-fall deficient. The yearly mean temperature was 0.29° low.

STATION, PATERSON, N. J.

Latitude, 40° 55′ N.; Longitude, 74° 11′ W. Height of Rain Gauge above Sea Level, 142 feet.

OBSERVER, WILLIAM FERGASON, CITY SURVEYOR.

	Barometer. Reduced to 32°.			Thermometer.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.						
1883.													
July				97	59	70	38			2.92		11	
August				90	57	71	33			1.30		4	
September				81	49	66	32			5.41		6	
October				85	34	52	41			4.28		12	
November				70	22	44	46			0.97		7	
December				53		32	58			2.89	25.5	12	
1884.													
January				49		26	46			5.16	12.5	13	
February				53	5	25	47			5.74	10.5	16	
March				69	6	35	63			3.30	2.5	10	
April				76	33	48	49			2.40		8	
May				87	40	60	47			4.47		11	
June				92	48	69	27			4.36		6	
For the year										48.20	50	117	

* Including melted snow.

STATION, NEWARK, N. J.

Latitude, 40° 44′ N.; Longitude, 74° 10′ W. Height of Barometer Cistern above Sea Level, 35 feet.

OBSERVER, DR. WARD.

	Barometer. Reduced to 32°.			Thermometer.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation equaled 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.						
1883.													
July	30.2	29.8	30.0	97.0	55.0	75.37	20.33		N.W.	2.76		15	18
August	30.3	29.75	30.02	90.0	54.0	70.65	21.411		W., N.W.	2.46		4	14
September	30.33	29.653	29.991	84.0	41.0	62.21	17.45		N.E., S.W.	4.74		5	11
October	30.65	29.525	30.09	78.0	33.0	57.75	13.875		N.E., N.W.	5.36		10	15
November	30.63	29.76	30.22	69.0	19.5	43.33	11.59		W., S.W.	1.43		5	12
December	30.78	29.75	30.035	54.0	2.0	32.3	10.1		W., N.W.	2.73	.25	13	15
1884.													
January	30.9	29.4	30.15	42.75	3.0	23.02	15.07		S.E., N.W.	5.16	4.25	9	17
February	30.7	29.3	30.0	55.5	5.0	24.28	10.88		W., N.W.	4.14	7.0	10	20
March	30.4	29.55	29.97	61.0	3.5	36.35	17.15		N.W.	5.65	1.0	5	24
April	30.2	29.225	29.71	69.5	31.0	48.337	16.83		N.W.	2.66		7	26
May	30.275	29.7	29.98	89.0	42.0	61.116	15.66		N.W., S.W.	4.04		5	[illegible]
June	30.3	29.65	30.02	94.0	50.0	72.85	19.96		S.E., S.W.	4.96		4	22
For the year													

* Including melted snow.

STATION, NEW BRUNSWICK, N. J.

Latitude, 40° 29′ N.; Longitude, 74° 26′ W., or 2′ 37′ E. Height, 115 feet.

OBSERVER, P. VANDERBILT SPADER.

	Barometer Reduced to 32°.			Thermometer.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation equaled 0.01.	Cloudy days.
	Max	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.						
1883.													
July	......	......	......	......	......	......	......	......	......	3.44	......	14	......
August	......	......	......	......	......	......	......	......	......	4.40	......	6	......
September	......	......	......	......	......	......	......	......	......	3.35	......	12	......
October	......	......	......	......	......	......	......	......	......	4.29	......	12	......
November	......	......	......	......	......	......	......	......	......	1.49	......	11	......
December	......	......	......	......	......	......	......	......	......	3.61	......	14	......
1884.													
January	......	......	......	......	......	......	......	......	......	5.63	......	13	......
February	......	......	......	......	......	......	......	......	......	5.28	......	19	......
March	......	......	......	......	......	......	......	......	......	4.23	......	15	......
April	......	......	......	......	......	......	......	......	......	2.20	......	9	......
May	......	......	......	......	......	......	......	......	......	3.17	......	11	......
June	......	......	......	......	......	......	......	......	......	5.34	......	9	......
For the year	......	......	......	......	......	......	......	......	......	46.43	......	145	......

* Including melted snow.

STATION, VINELAND, N. J.

Latitude, 39° 29′; Longitude, 75° 1′ W. Height of Barometer Cistern above Sea Level, 110 feet.

OBSERVER, J. INGRAM, M.D.

	Barometer. Reduced to 32°.			Thermometer.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.						
1883.													
July	30.069	29.580	29.856	98	56	77.68	......	68.37	S.W.	3.515	......	8	13
August	30.096	28.654	29.902	94	50	70.95	......	61.32	N.E., S.E.	2.000	......	6	7
September	30.221	29.521	29.932	84	40	66.38	......	72.19	N.E.	4.980	......	8	17
October	30.462	29.311	30.025	82	32	55.76	......	77.01	N.E., N.	7.050	......	14	14
November	30.458	29.663	30.033	76	20	46.07	......	63.58	S.W., N.W.	1.870	......	8	13
December	30.433	29.446	29.981	62	10	35.44	......	63.47	SWNENW	5.160	8.75	11	14
1884.													
January	30.656	29.060	29.998	52	4	28.11	......	65.48	N.E., N.W.	11.550	12.00	14	18
February	30.587	29.070	29.970	67	10	40.15	......	74.31	S.W., N.E.	6.775	0.50	15	16
March	30.218	29.358	29.772	68	10	41.44	......	71.64	N.W., N.E.	6.590	8.00	14	17
April	29.950	28.961	29.672	74	28	50.53	......	70.10	W., N.W.	3.330	2.00	6	16
May	30.041	29.410	29.736	92	42	64.93	......	67.27	S.W.	1.990	......	5	10
June	30.399	29.669	29.952	98	48	73.43	......	64.56	S.W.	1.968	......	7	10
For the year	......	......	29.903	......	......	54.15	......	68.315	......	56.793	31.25	116	159

*Including melted snow.

STATION, BARNEGAT CITY, N. J.

Latitude, 39° 46′ N.; Longitude, 74° 6′ W. Height of Barometer Cistern above Sea Level, 22 feet.

OBSERVER, U. S. SIGNAL SERVICE.

	Barometer.† Reduced to 32°.			Thermometer.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Range.‡						
1883.													
July	30.236	29.703	29.968	91.0	59.5	72.9	31.5	81.5	S.W.	2.43	....	14	8
August	30.245	29.648	30.014	86.0	56.0	70.4	28.0	76.7	E.	2.13	....	7	4
September	30.596	29.524	30.049	77.0	48.0	64.4	29.0	80.5	E.	4.51	....	12	9
October	30.614	29.434	30.133	74.0	40.2	56.4	33.7	78.6	E.	6.51	....	19	13
November	30.615	29.714	30.134	63.0	24.0	46.3	39.0	74.0	S.W.	1.06	....	14	8
December	30.637	29.163	30.067	57.0	11.0	37.2	46.0	75.7	N.	2.83	....	16	13
1884.													
January	30.639	29.139	30.112	52.0	7.0	36.9	45.0	77.7	N.	5.26	....	16	11
February	30.716	29.145	30.052	56.8	§13.0	37.8	43.8	67.7	N.W.	1.11	....	21	10
March	30.454	29.170	29.990	63.0	11.3	39.0	51.7	79.2	N.W.	2.26	....	15	16
April	30.176	29.093	29.827	61.9	32.3	46.9	29.6	71.6	N.W.	0.97	....	8	12
May	30.249	29.571	29.934	81.2	42.4	58.7	36.8	74.5	S.W.	0.79	....	9	6
June	30.491	29.744	30.061	82.6	48.1	66.2	34.7	77.6	S.W.	2.24	....	5	4
For the year	....	....	....	....	....	....	....	....	....	....	....	....	....

* Including melted snow, dew, fog, sleet, hail and frost.
† Corrected for temperature and instrumental error only.
‡ The mean daily range is probably what is desired.
§ From exposed thermometer, minimum broken.

STATION, CAPE MAY, N. J.

Latitude, 38° 56′ N.; Longitude, 74° 58′ E. Height of Barometer Cistern above Sea Level, 27 feet.

OBSERVER, U. S. SIGNAL SERVICE.

	Barometer.† Reduced to 32°.			Thermometer.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Range.‡						
1883.													
July	30.212	29.672	29.962	89.0	59.0	73.7	30.0	80.7	S.	2.59	....	6	1
August	30.211	29.634	29.989	86.0	57.0	71.6	29.0	75.4	S.	3.05	....	6	4
September	30.361	29.658	30.085	80.0	44.5	66.2	35.5	77.5	N.E.	4.59	....	5	7
October	30.564	29.422	30.115	74.0	38.0	56.9	36.0	75.1	N.E.	3.63	....	15	9
November	30.608	29.751	30.129	64.0	22.0	45.8	42.0	75.6	N.W.	3.39	....	10	7
December	30.620	29.461	30.085	57.0	14.0	38.7	43.0	79.5	N.W.	3.81	....	12	8
1884.													
January	30.777	29.328	30.110	50.5	11.0	31.6	39.5	80.0	N.W.	5.56	....	17	11
February	30.686	29.125	30.052	54.0	13.0	39.5	41.0	84.0	N.W.	6.22	....	17	8
March	30.421	29.448	29.990	54.5	13.0	40.0	41.5	83.9	N.W.	5.61	....	18	6
April	30.163	29.168	29.924	63.5	32.0	46.2	31.5	79.0	N.W.	2.34	....	11	10
May	30.280	29.591	29.926	80.0	43.0	56.8	37.0	76.2	S.	1.19	....	4	9
June	30.363	29.679	30.024	86.0	49.0	67.6	37.0	79.8	S.	1.62	....	6	7
For the year	....	....	....	....	....	....	....	....	....	....	....	....	....

* Including melted snow, dew, fog, sleet, hail and frost.
† Corrected for temperature and instrumental error only.
‡ The mean daily range is probably what is desired.

STATION, SANDY HOOK, N. J.

Latitude, 40° 28′ N.; Longitude, 74° 0′ W. Height of Barometer Cistern above Sea level, 28 feet.

OBSERVER, ——— ———.

	Barometer,† Reduced to 32°.			Thermometer.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation equaled 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Range.‡						
1883.													
July	30.22	29.697	29.956	95.0	59.0	74.5	36.0	70.4	S.W.	2.3	....	15	5
August	30.279	29.635	30.018	91.0	61.0	72.2	30.0	66.5	W.	3.44	....	7	4
September	30.427	29.466	30.066	83.0	49.0	64.3	34.0	75.0	N.W., S.E.	4.63	....	10	10
October	30.636	29.381	30.146	77.0	39.0	55.2	38.0	72.1	E.	5.2	....	13	7
November	30.591	29.691	30.129	67.0	22.0	46.0	45.0	74.1	N.W.	1.54	....	10	5
December	30.675	29.401	30.090	57.0	5.5	35.4	51.5	73.7	N.W.	2.57	....	14	11
1884.													
January	30.832	29.116	30.115	50.0	8.0	27.7	42.0	72.4	W.	6.76	....	15	8
February	30.78	29.157	30.067	62.5	6.0	35.8	56.5	81.6	E	4.72	....	16	9
March	30.443	29.489	30.002	63.6	6.9	38.0	56.7	75.9	N.W.	4.22	....	17	11
April	30.164	29.102	[illegible]	67.0	34.0	47.3	33.0	76.1	N.W.	3.15	....	9	11
May	30.299	29.563	29.931	86.0	45.6	58.9	41.0	70.1	N.W.	5.37	....	11	[illegible]
June	30.523	29.734	30.085	91.2	51.3	65.4	39.9	70.6	S.	4.52	....	5	3
For the year	....	....	....	....	....	....	....	....	....	....	....	....	....

* Including melted snow, dew, fog, sleet, hail and frost.
† Corrected for temperature and instrumental error only.
‡ The mean daily range is probably what is desired, and will be sent on application.

In order to complete the tables of previous years, we add first the tables of Cape May, Barnegat and Sandy Hook for the four years previous.

STATION, CAPE MAY, N. J.

Latitude, 38° 56′ N.; Longitude, 74° 58′ W. Height of Barometer Cistern above Sea Level, 27 feet.

	Barometer. Reduced to 32°.			Thermometer.									
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.	Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1878.													
July	30.19	29.60	29.95	90	66	76.6	....	77.3	S.	2.43	....	7	5
August	30.20	29.62	29.9[illegible]	85	60	73.8	....	78.3	S. E.	6.41	....	10	7
September	30.44	29.68	30.11	86	46	70.6	....	76.7	N. E.	1.33	....	6	6
October	30.39	29.22	30.03	77	36	60.0	....	72.9	N.W.	3.38	....	9	6
November	30.53	28.95	29.96	64	29	47.3	....	74.0	N.W.	3.17	....	10	9
December	30.54	28.84	30.01	59	18	36.3	....	71.1	N.W.	7.06	....	14	7
1879.													
January	30.58	29.30	30.04	55	1	29.9	....	78.7	N.W.	3.81	....	9	7
February	30.74	29.46	30.06	50	12	32.1	....	74.3	N.W.	3.09	....	13	14
March	30.70	29.33	30.07	61	21	42.1	....	76.6	N.W.	2.99	....	15	13
April	30.39	29.34	29.88	76	29	47.6	....	74.0	N.W.	4.34	....	10	13
May	30.42	29.71	30.03	77	43	61.5	....	70.7	S.	0.25	....	4	5
June	30.25	29.50	29.94	81	52	69.2	....	72.3	S.	4.21	....	9	11
July	30.31	29.59	29.97	83	57	72.7	....	77.6	S.	4.94	....	8	9
August	30.20	29.51	29.91	87	58	72.7	....	79.1	S.	16.58	....	12	11
September	30.44	29.76	30.10	81	45	67.1	....	75.0	S E.	1.89	....	8	5
October	30.81	29.54	30.14	81	33	63.9	....	73.3	S. W.	0.97	....	5	4
November	30.57	29.50	30.14	69	22	48.1	....	65.1	N W.	1.09	....	[illegible]	7
December	30.63	29.66	30.15	60	15	43.9	....	75.8	S.	6.19	....	16	14
1880.													
January	30.65	29.58	30.16	[illegible]	18	43.2	....	80.3	N.W.	2.17	....	17	8
February	30.64	29.24	30.09	59	12	41.7	....	80.7	S.	2.40	....	7	9
March	30.48	29.39	30.02	65	23	42.6	....	71.5	N.	7.91	....	16	15
April	30.39	29.55	29.99	67	31	52.3	....	68.6	S.	1.64	....	11	4
May	30.23	29.81	30.04	81	41	[illegible]	....	75.1	S.	1.27	....	9	8
June	30.29	29.63	29.97	89	52	71.2	....	75.3	S.	3.79	....	[illegible]	6
July	30.20	29.70	29.96	90	56	75.3	....	77.6	S.	4.58	....	14	12
August	30.39	29.75	30.04	84	[illegible]	73.2	....	80.5	S.	7.49	....	13	13
September	30.36	29.69	30.02	87	52	69.1	....	74.1	N.W.	2.91	....	9	6
October	30.45	29.49	30.06	75	42	58.7	....	70.8	S.	5.07	....	3	8
November	30.70	29.60	30.21	67	16	44.1	....	68.1	N.	4.79	....	15	14
December	30.50	29.57	30.00	55	2	31.2	....	78.1	N.W.	9.21	....	15	12
1881.													
January	30.68	29.36	30.11	46	[illegible]	29.6	....	78.7	N.W.	7.36	....	11	13
February	[illegible]	29.41	30.16	51	5	33.6	....	73.3	N.W.	4.23	....	11	7
March	30.34	29.03	29.72	53	25	40.5	....	70.3	N.W.	4.94	....	11	12
April	30.34	29.49	29.87	70	27	45.9	....	74.0	N.W.	1.34	....	12	11
May	30.44	29.59	30.02	75	43	59.6	....	82.7	S E.	3.51	....	10	12
June	30.17	29.61	29.83	83	53	66.5	....	76.8	S.E.	5.11	....	15	10
July	30.20	29.67	29.90	87	62	75.4	....	68.6	S.	1.20	....	12	9
August	30.31	29.66	30.02	87	68	73.5	....	77.6	S.	2.26	....	8	6
September	30.32	29.84	30.07	85	55	74.5	....	79.8	S.	1.22	....	8	4
October	30.52	29.54	30.11	81	39	62.7	....	76.1	S.	4.53	....	10	11
November	30.71	29.64	30.15	67	27	51.6	....	77.0	N.W.	5.22	....	15	17
December	30.65	29.46	30.16	62	30	43.3	....	75.5	N.W.	2.07	....	14	15
1882.													
January	30.84	29.18	30.11	52	5	36.0	....	77.2	N.W.	6.32	....	19	15
February	30.66	29.28	30.10	58	23	40.8	....	73.6	N.W.	3.19	....	12	8
March	30.64	29.57	30.04	63	23	45.0	....	70.7	N.W.	4.90	....	13	12
April	30.48	29.42	30.01	66	29	49.6	....	74.4	N.W.	2.44	....	12	9
May	30.40	29.43	29.95	75	34	55.1	....	78.6	N.E.	4.40	....	12	11
June	30.26	29.55	29.84	83	53	68.5	....	76.5	S.	2.62	....	9	8

* Including melted snow.

STATION, BARNEGAT, N. J.

Latitude, 39° 48′; Longitude, 74° 9′. Height of Barometer Cistern above Sea Level, 20 feet.

	Barometer. Reduced to 32°. Max.	Barometer. Min.	Barometer. Mean.	Thermometer. Max.	Thermometer. Min.	Thermometer. Mean.	Thermometer. Mean Monthly Range.	Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1878.													
July	30.20	29.57	29.94	94.0	61.0	71.7	....	82.4	S.	6.39	....	10	7
August	30.21	29.65	29.90	85.0	59.0	71.8	....	80.7	S.	4.78	....	16	7
September	30.45	29.69	30.12	84.0	49.0	67.8	....	79.4	E.*	2.90	....	10	7
October	30.39	29.36	30.02	75.0	36.0	57.0	....	76.5	N. W.	2.35	....	11	6
November	30.53	28.96	29.95	62.0	28.0	43.4	....	77.3	N. W.	4.75	....	13	9
December	30.49	28.80	29.99	57.0	12.0	32.5	....	79.2	N. W.	6.74	....	10	6
1879.													
January	30.61	29.29	30.02	61.0	—1.0	27.5	....	81.6	N. W.	3.69	....	9	8
February	30.76	29.40	30.05	47.0	6.0	28.7	....	78.2	N. W.	3.82	....	16	6
March	30.70	29.23	30.07	65.0	21.0	38.4	....	78.9	S.	3.46	....	20	9
April	30.40	29.30	29.89	69.0	25.0	44.9	....	76.2	N. W.	4.42	....	14	14
May	30.50	29.73	30.06	72.0	39.0	56.0	....	77.2	S.	2.00	....	7	5
June	30.25	29.47	29.95	84.0	48.0	65.7	....	78.5	S.	4.06	....	12	5
July	30.30	29.53	29.97	96.0	53.0	69.5	....	80.7	S.	3.57	....	14	7
August	30.19	29.47	29.93	92.0	53.0	70.9	....	81.4	S.	12.33	....	11	11
September	30.46	29.76	30.11	81.0	45.0	63.7	....	78.2	S.	2.15	....	8	6
October	30.79	29.47	30.14	82.0	30.0	59.0	....	79.5	N. W.	1.05	....	9	5
November	30.56	29.43	30.13	73.0	14.0	42.2	....	76.2	N. W.	2.10	....	12	7
December	30.64	29.63	30.15	60.0	10.0	39.6	....	80.0	N. W.	6.68	....	17	16
1880.													
January	30.69	29.59	30.16	61.0	43.0	40.5	....	85.5	N. W.	1.75	....	18	11
February	30.63	29.09	30.09	70.0	59.0	36.8	....	77.0	N. W.	3.29	....	13	10
March	30.46	29.34	30.02	73.0	55.0	39.1	....	73.9	N. W.	6.61	....	20	14
April	30.24	29.55	30.00	79.0	53.0	44.0	....	73.9	S.	3.29	....	12	7
May	30.23	29.74	30.04	91.0	57.0	62.0	....	75.2	S.	0.83	....	6	4
June	30.29	29.54	29.97	98.0	45.0	69.1	....	77.5	S.	3.67	....	11	5
July	30.19	29.66	29.96	94.0	56.0	72.9	....	79.6	S.	5.78	....	16	11
August	30.44	29.72	30.04	87.0	55.0	70.7	....	82.3	S.	6.15	....	10	11
September	30.37	29.63	30.02	89.0	44.0	66.4	....	76.3	S.	3.14	....	9	6
October	30.42	29.43	30.09	79.0	33.0	54.7	....	75.9	S.	4.05	....	10	7
November	30.74	29.59	[illegible]	67.0	13.0	39.9	....	74.3	N. W.	4.35	....	14	14
December	30.45	29.56	29.99	63.0	—7.0	27.6	....	79.9	N. W.	5.95	....	15	9
1881.													
January	30.64	29.23	30.11	49.0	1.0	26.6	....	76.4	N. W.	5.43	....	15	15
February	30.78	29.35	30.15	59.0	—4.0	29.4	....	75.2	N. W.	5.39	....	15	10
March	30.35	29.03	29.70	63.0	21.0	36.9	....	75.2	N. W.	7.65	....	16	15
April	30.34	29.41	29.86	70.0	22.0	43.6	....	73.3	N. W.	1.36	....	12	11
May	30.46	29.56	30.02	81.0	37.0	56.4	....	86.6	S.	1.77	....	11	11
June	30.16	29.60	29.86	96.0	48.0	63.5	....	80.9	E.	6.18	....	14	12
July	30.21	29.56	29.91	92.0	60.0	72.4	....	79.6	S.	1.99	....	7	6
August	30.31	29.62	29.99	88.0	60.0	71.1	....	81.3	S.	5.54	....	11	5
September	30.32	29.57	30.06	96.0	56.2	71.6	....	85.1	E.	3.66	....	9	7
October	30.54	29.45	30.11	82.5	35.5	59.8	....	79.1	S.	4.35	....	9	12
November	30.67	29.57	30.15	70.5	22.5	47.3	....	76.9	N. W.	3.64	....	14	14
December	30.62	29.35	30.13	60.0	21.0	40.6	....	81.0	N. W.	3.50	....	14	15
1882.													
January	30.82	29.12	30.12	64.0	—1.0	33.7	....	79.9	N. W.	6.79	....	16	13
February	30.72	29.26	30.12	62.0	14.0	36.3	....	81.6	N. W.	6.91	....	14	8
March	30.66	29.56	30.07	60.2	20.0	40.1	....	74.2	N. W.	4.44	....	12	12
April	30.51	29.40	30.01	74.0	26.6	45.9	....	71.5	S.	4.16	....	11	12
May	30.43	29.42	29.99	75.8	36.0	52.2	....	79.4	S.	7.22	....	18	9
June	30.25	29.51	29.86	96.6	57.0	66.2	....	76.5	S.	3.26	....	11	6

* Including melted snow.

STATION, SANDY HOOK, N. J.

Latitude, 40° 28′ N.; Longitude, 74° 1′ W. Height of Barometer Cistern above Sea Level, 28 feet.

	Barometer. Reduced to 32°.			Thermometer.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation reached 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.						
1878.													
July	[illegible]	29 57	29.93	97.0	62.0	75.6	....	75.7	W.	[illegible]	....	9	9
August	30.20	29 58	29 89	90.0	63.0	72.5	....	79.4	W.	6 19	....	12	11
September	30.43	29.66	30 12	87.0	48.0	67.8	....	78.3	E.	4.09	....	9	8
October	30.37	29 34	30 00	79.0	42.0	58 5	....	70.9	W.	2.74	....	10	7
November	30.56	28.91	29.93	60.0	30.0	44.4	....	73.5	W.	6.96	....	12	10
December	30.49	[illegible]	29.96	59.0	13.0	33.5	....	72.7	W.	7.75	....	10	11
1879.													
January	30 47	29 37	29.97	49.0	—2.0	27.0	....	76.4	W.	3.22	....	8	10
February	[illegible]	29 34	30.03	53.0	8 0	28.1	....	72.9	N.W.	2.77	....	10	11
March	30 69	29 24	30.06	60.0	21.0	37.7	....	71 6	N.W.	4.84	....	11	8
April	30.37	29.35	29 88	71.0	24.0	44.8	....	70.1	N W.	6.30	....	13	13
May	30.40	[illegible]	30 04	87.0	41.0	60.0	....	70.9	S.E.	3.59	....	[illegible]	8
June	30.26	29.43	29 93	92.0	50 0	69.3	....	71.8	S.W.	5.86	....	16	15
July	30 27	29.49	29 95	96.0	50.0	73 4	....	71.0	S.W.	5.76	....	10	14
August	30 16	29.56	29 92	92 0	59.0	72.0	....	70.9	S.W.	12.44	....	10	12
September	30.42	29.72	30.10	87.0	48.0	64.2	....	73.2	S.W.	1.13	....	7	9
October	30.77	29.47	30 12	84.0	34.0	60.5	....	71.1	W.	0 47	....	[illegible]	7
November	30 50	29 38	30.11	71.0	18.0	44.1	....	70.1	N.W.	2.15	....	6	10
December	30.60	29.58	[illegible]	61.0	10.0	38.5	....	76.2	S.W.	6.02	....	14	16
1880.													
January	30.70	29.49	30.16	58.0	21.0	39.6	....	80.3	W.	1.77	....	13	13
February	30.59	29 88	30.07	64.0	10.0	36.6	....	75.3	W.	1.67	....	11	9
March	30.47	29 33	30.01	67.0	17.0	37.6	....	72.1	N.W.	5.86	....	18	12
April	30.32	29.48	29.97	77.0	27.0	49.3	....	69.0	N.W.	2 69	....	10	10
May	30.40	29 66	30.02	93.0	35.0	64.8	....	71.0	S W.	2.01	....	8	4
June	30.26	29.50	29.95	93.0	50 0	71.4	....	68.6	W.	2 78	....	6	3
July	30.15	29 62	29 94	89.0	50.0	75.1	....	72.6	S W.	6.43	....	13	9
August	30.39	29 66	30 03	90 0	59.0	71.7	....	79.4	S.W.	4.26	....	9	8
September	30.34	29.63	30.00	92.0	51.0	67.5	....	73.8	W.	3.35	....	6	8
October	30 37	29.43	30 09	78 0	36.0	56.1	....	71.1	S.W.	3.97	....	11	6
November	30 70	29.48	30.20	69.0	14.0	43.1	....	65.7	N W.	3.76	....	8	4
December	30 42	29 55	29.98	52.0	—5.0	29.5	....	[illegible]	N.W.	2.51	....	8	10
1881.													
January	30.65	29.25	30 09	40.0	8.0	26.2	....	73.1	N.W., W.	[illegible]	....	10	12
February	30 80	29.33	30.14	53.0	zero.	29.1	....	75.7	N.W.	5 37	....	12	6
March	30 35	29.02	29.70	53.0	22.0	37.5	....	77.2	N.W.	6.92	....	12	13
April	30 37	29.39	29.86	74.5	23.0	45 6	....	69.3	N.W.	1.41	....	8	5
May	30 46	29.57	30.02	91 0	42.5	[illegible]	....	79.3	S.E.	3.33	....	13	10
June	30.19	29 61	29 88	87.2	50.5	65 4	....	77.1	N.W.	6.80	....	16	11
July	30.22	29.56	29.91	89.2	63.2	74.0	....	74.9	S.E.	2.43	....	10	5
August	30 31	29.59	29.99	96 2	60.9	74.9	....	72.1	S. W.	0.63	....	10	3
September	30 37	29.52	30.07	101.0	58 0	74.1	....	77.3	S.E.	3.57	....	10	6
October	30.56	29 43	30 11	87 0	39.0	61 3	....	68.4	N.W.	2.71	....	8	8
November	30 66	29 56	30 18	73.0	26 0	49.1	....	67.2	N.W.	3.84	....	12	12
December	30.62	29.34	30.12	68.5	23.0	41.9	....	77.1	S.W.	5.00	....	12	13
1882.													
January	30 82	29.21	30.12	50.0	zero.	31.9	....	79.5	N.W.	6 47	....	17	12
February	[illegible]	29.36	30.11	58.5	20.0	36 6	....	77.7	N.W.	4 88	....	11	6
March	30.68	29.55	30 06	58.0	20.0	40.5	....	75.3	N.W.	4.00	....	12	6
April	30 51	29 35	30 00	69.0	27.0	46.8	....	73.0	N.W.	3.19	....	13	10
May	30 44	29.42	29.99	79.0	36.0	54.3	....	74.9	N.E.	7.21	....	15	10
June	30 23	29.47	29.87	91.0	50.5	68.7	....	73.7	N.W.	2.60	....	10	4

*Including melted snow.

Next we place the observations for all the Stations, from July 1st, 1882, to July 1st, 1883, thus completing the aggregate for five years:

STATION, DENNIS LIBRARY, NEWTON, N. J.

Latitude, 41° 2′ 45″ N. Longitude, 2° 19′ [illegible] E. Height of Barometer Cistern above Sea Level, 660 feet.

OBSERVER, MRS. E. FOSTER.

	Barometer. Reduced to 32°.			Thermometer.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precip'tation exceeded 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.						
1882.													
July	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	——	[illegible]	S. W.	[illegible]	[illegible]	6	3
August	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	——	[illegible]	S. W.	[illegible]	——	6	11
September	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	——	[illegible]	N. E.	[illegible]	——	12	12
October	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	——	[illegible]	N. E.	[illegible]	trace	13	14
November	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	——	[illegible]	N. E.	[illegible]	[illegible]	[illegible]	[illegible]
December	[illegible]	[illegible]	[illegible]	[illegible]	6.1	[illegible]	——	[illegible]	N. W.	[illegible]	3.3	8	[illegible]
1883.													
January	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	——	[illegible]	N. E.	[illegible]	[illegible]	[illegible]	[illegible]
February	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	——	[illegible]	S. W., N. W.	[illegible]	[illegible]	[illegible]	[illegible]
March	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	——	[illegible]	N. W., S. W.	[illegible]	[illegible]	7	6
April	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	——	[illegible]	S. W., N. E.	[illegible]	3.3	13	9
May	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	——	[illegible]	S. W.	[illegible]	——	10	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	——	[illegible]	S. W.	[illegible]	——	11	[illegible]
For the year	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	——	[illegible]	——	[illegible]	[illegible]	[illegible]	[illegible]

* Including melted snow.

REMARKS.—1882. July had a high humidity [illegible]

There were forty-five fogs, nineteen frosts and twenty-five thunder-storms during the year.

STATION, PATERSON, N. J.

Latitude, 40° 55′ N.; Longitude, 74° 11′ W. Height of Rain Gauge above Sea Level, 142 feet.

OBSERVER, JOHN T. HILTON, CITY SURVEYOR.

	BAROMETER. Reduced to 32°.			THERMOMETER.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation equaled 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.						
1882.													
July	......	......	......	96	58	75.31	......	......	S.W.	7.01	......	8	......
August	......	......	......	95	56	71.0	......	......	S.W.	2.37	......	6	......
September	......	......	......	87	50	67.0	......	......	S.W.	25.98	......	12	......
October	......	......	......	78	37	56.0	......	......	W., S.W.	3.31	......	14	......
November	......	......	......	63	13	39.0	......	......	N.W.	1.62	.21	6	......
December	......	......	......	40	18	30.61	......	......	W.	4.00	......	9	......
1883.													
January	......	......	......	......	45	26.0	......	......	N.W.	4.23	15.5	15	......
February	......	......	......	52	11	30.0	......	......	N.W.	5.125	12.0	10	......
March	......	......	......	60	9	32.0	......	......	N.W.	1.91	.11	6	......
April	......	......	......	68	27	43.0	......	......	W.	5.99	......	12	......
May	......	......	......	85	39	59.0	......	......	S.W.	5.55	......	11	......
June	......	......	......	95	56	66.0	......	......	S.W.	5.80	......	11	......
For the year	......	......	......	......	......	......	......	......	......		......	......	......

* Including melted snow.

STATION, NEWARK, N. J.

Latitude, 40° 44′ N.; Longitude, 74° 10′ W. Height of Barometer Cistern above Sea Level, about 30 feet.

OBSERVER, W. A. WHITEHEAD.

	BAROMETER.			THERMOMETER.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.						
1882.													
July	30.30	29.55	30.06	96.5	55.0	76.82	......	......	W., N.W.	3.52	......	6	13
August	30.35	29.80	30.08	93.25	52.5	73.31	......	......	S.E.	1.31	......	7	13
September	30.35	29.90	30.06	86.0	47.0	66.75	......	......	N., N.E.	17.66	......	13	16
October	30.45	29.90	30.14	72.5	41.0	57.05	......	......	N. E., S.E.	2.00	......	12	14
November	30.55	29.88	30.22	70.0	19.0	47.52	......	......	N.W.	1.77	13.25	9	9
December	30.48	29.78	30.14	46.75	10.75	30.59	......	......	N.W., S.W.	1.95	1.75	6	10
1883.													
January	30.62	29.72	30.23	44.75	2.5	25.60	......	......	N.W., S.W.	3.71	14.0	13	15
February	30.75	29.85	30.33	53.25	14.0	30.48	......	......	N.W., S.W.	4.93	11.0	10	11
March	30.58	29.70	30.07	60.0	7.25	32.31	......	......	N.W., S.W.	2.00	8.5	6	8
April	30.93	29.75	30.05	71.0	23.5	47.65	......	......	N.W., N.E.	4.68	3.0	9	11
May	30.45	29.55	30.16	86.5	38.0	61.06	......	......	N.E., N.	3.35	......	10	16
June	30.30	29.65	30.01	91.0	50.0	72.85	......	......	S.E., S.W.	4.97	......	9	13
For the year	30.93	29.55	......	96.5	2.5	......	......	......	......	51.82	51.50	110	149
Mean	30.50	29.74	30.13	...		51.24	......	.	.	......	......	......	......

* Including melted snow.

STATION, NEW BRUNSWICK, N. J.

Latitude, 40° 29′ N.; Longitude, 74° 26′ W., or 2° 37′ E. Height, 115 feet.

OBSERVER, P. VANDERBILT SPADER.

	Barometer. Reduced to 32°.			Thermometer.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation equaled 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.						
1882.													
July				91	59	70.76				3.04			
August				93	54	69.51				3.30			
September				96	50	61.76				15.52			
October				78	41	56.24				1.42			
November				71	16	37.14				1.60			
December				45	4	27.76				1.91			
1883.													
January				45	3	24.90				3.71			
February				55	6	28.25				4.67			
March				62	7	29.63				1.96			
April				70	25	41.36				4.03			
May				82	29	54.34				2.82			
June				95	50	69.57				5.24			
For the year										49.17			

* Including melted snow.

STATION, FREEHOLD, N. J.

Latitude, 40° 15′ N.; Longitude, 74° 16′ W. Height of Barometer Cistern above Sea Level, 216 feet.

OBSERVER, CHARLES F. RICHARDSON.

	Barometer. Reduced to 32°.			Thermometer.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation equaled 0.01.	Cloudy Days.	Thunder and Lightning Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.							
1882.														
July	30.06	29.44	29.78	96.0	64.0	74.6		72.6	S.W.	2.11		6	3	6
August	30.06	29.41	29.80	90.0	50.0	70.4		82.2	S.	5.64		10	5	3
September	30.02	29.39	29.82	86.0	43.0	65.8		85.3	N.	11.61		14	11	7
October	30.10	29.51	29.86	74.0	38.0	56.2		85.5	N.	2.43		16	14	2
November	30.28	29.47	29.91	70.0	16.0	38.3		77.7	W.	1.63	7.6	10	6	
December	30.17	29.49	29.86	46.0	8.0	29.8		75.4	W.	2.17		7	6	
1883.														
January	30.36	29.32	29.94	43.0	1.0	25.5		79.5	N.	4.00	13.9	18	14	1
February	30.44	29.51	30.01	61.0	11.0	30.8		76.1	W.	5.62	12.6	15	6	
March	30.21	29.06	29.74	63.0	10.0	32.5		64.4	W.	1.73	9.4	7	2	
April	30.15	29.43	29.78	71.0	24.0	44.9		77.7	S.	3.90		12	5	4
May	30.13	29.29	29.74	83.0	34.0	58.6		73.6	S.	4.12		10	9	3
June	30.19	29.41	29.76	91.0	48.0	70.5		79.1	S.W.	6.91		12	4	9
For the year	30.18	29.38	29.75	72.8	28.9	49.7		77.4	W.	51.57	43.5	139	88	41

* Including melted snow.

First frost, October 25th; latest frost, May 18th. No snow in measurable amount in December.

STATION, VINELAND, N. J.

Latitude, 39° 29′ N.; Longitude, 75° 1′ W. Height of Barometer Cistern above Sea Level, 111 feet.

OBSERVER, J. INGRAM, M.D.

	Barometer. Reduced to 32°.			Thermometer.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation equaled 0.01.	Cloudy Days.	Clear Observations.	Average Clouds.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.								
1882.															
July	30.180	29.534	29.887	96	64	77.76	....	70	S.W., N.W.	2.23	....	7	31	30	66.33
August	30.178	29.423	29.924	88	51	71.94	....	79	S.W., S.E.	9.29	....	13	28	28	61.50
September	30.112	29.505	29.906	87	45	66.01	....	79	S.W., N.	12.35	....	8	25	25	66.53
For 3 mos	30.156	29.457	29.906	90	50	72.56	....	76	....	23.87	....	28	67	73	65.12
October	30.170	29.609	29.954	74	37	59.56	....	71	N.E., S.W.	1.77	....	11	27	27	67.73
November	30.342	29.718	30.015	72	22	41.48	....	63	N.W., N.E.	.99	....	6	28	37	63.73
December	30.246	29.619	29.990	51	10	33.17	....	60	N.W., W.	2.47	....	5	30	34	56.90
For 3 mos	30.266	29.648	29.986	66	23	44.74	....	65	....	5.23	....	22	85	88	62.79
1883.															
January	30.472	29.323	30.060	45	4	28.73	....	56	N.W., N.E.	6.13	18.75	17	29	13	80.30
February	30.612	29.591	30.173	66	16	35.65	....	59	N.W., S.W.	6.47	4.50	12	28	18	74.20
March	30.360	29.145	29.776	64	12	35.95	....	55	N.W., S.W.	2.92	8.50	6	27	37	54.89
For 3 mos	30.481	29.353	29.983	58	11	33.44	....	58	....	15.52	31.75	35	84	68	69.73
April	30.297	29.524	29.831	80	26	49.24	....	66	S.W., N.W.	3.96	....	11	30	18	73.30
May	30.156	29.319	29.819	84	34	63.65	....	64	S.W., N.E.	1.80	....	5	29	28	67.60
June	30.269	29.550	29.846	92	60	75.24	....	71	S.W., S.E.	3.72	....	7	28	21	67.10
For 3 mos	30.241	29.464	29.832	85	38	62.71	....	67	....	9.48	....	23	87	67	69.33
For the year	30.296	29.488	29.926	75	30	53.37	....	65	....	54.11	31.75	108	343	296	66.74

* Including melted snow.

REMARKS.—Under the head of "cloudy days" is to be understood *all* days in which *any* clouds were found. By "clear observations" is to be understood the total observations free from clouds in each month, and the "average clouds" explains itself.

STATION, CAPE MAY, N. J.

Latitude, 38° 56′ N.; Longitude, 74° 58′ W. Height of Barometer Cistern above Mean Sea Level, 27 feet.

OBSERVER, U. S. SIGNAL SERVICE.

	BAROMETER.†			THERMOMETER.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation equaled 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.						
1882.													
July	30.274	29.632	30.004	86.0	62	73.7	....	79.8	S.	3.49	....	7	3
August	30.269	29.629	30.001	83.0	55	73.3	....	79.3	S.	10.29	....	13	11
September	30.251	29.474	30.006	88.0	50	70.0	....	78.8	S.	7.06	....	9	5
October	30.325	29.701	30.051	75.0	48	64.5	....	78.6	N.E.	1.46	....	11	9
November	30.500	29.708	30.125	68.0	30	47.8	....	82.4	N.	1.88	....	8	10
December	30.465	29.629	30.099	60.0	14	38.3	....	74.8	N.W.	3.88	....	7	5
1883.													
January	30.630	29.463	30.149	60.0	11	33.5	....	79.3	N.W.	5.00	....	15	12
February	30.745	29.715	30.248	56.5	21	39.4	....	74.6	N.W.	5.67	....	14	4
March	30.483	29.285	29.964	56.0	17	38.8	....	74.2	N.W.	4.66	....	11	6
April	30.382	29.634	29.984	62.5	29	46.5	....	77.9	S.	4.69	....	12	4
May	30.314	29.369	29.929	74.0	43	60.1	....	76.7	S.	1.17	....	6	3
June	30.396	29.657	29.969	81.0	55	68.6	....	82.7	S.	5.50	....	12	3
For the year	....	....	....	....	....	....	....	....	....	....	....	....	....

* Including melted snow.
† Corrected for temperature and instrumental error only.

STATION, BARNEGAT CITY, N. J.

Latitude, 39° 46′ W.; Longitude, 74° 6′ E. Height of Barometer Cistern above Mean Sea Level, 22 feet.

OBSERVER, U. S. SIGNAL SERVICE.

	BAROMETER.†			THERMOMETER.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation equaled 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.						
1882.													
July	30.293	29.563	29.998	92.6	55.7	72.5	....	80.2	S.	3.92	....	10	[illegible]
August	30.290	29.602	30.012	85.0	56.0	72.1	....	80.9	E.	8.21	....	10	12
September	30.228	29.477	30.014	83.0	49.0	68.5	....	81.8	E.	14.65	....	14	9
October	30.338	29.694	30.057	71.0	45.3	60.1	....	84.0	E.	4.16	....	11	10
November	30.509	29.681	30.122	70.0	24.4	42.3	....	76.0	N.	2.32	....	9	11
December	30.436	29.514	30.057	51.0	13.0	34.1	....	76.2	N.W.	3.36	....	8	5
1883.													
January	30.623	29.410	30.156	48.0	6.4	30.8	....	83.8	N.W.	2.91	....	14	19
February	30.784	29.684	30.244	60.0	17.0	35.2	....	76.6	N.W.	5.98	....	15	9
March	30.471	29.128	29.952	62.0	12.0	36.0	....	87.9	N.W.	3.25	....	9	7
April	30.444	29.598	29.989	61.3	32.0	46.0	....	79.5	S.W. & E.	3.93	....	17	12
May	[illegible]	29.439	29.949	75.0	46.2	56.8	....	80.5	E.	1.97	....	15	7
June	30.477	29.598	29.972	84.0	54.3	67.9	....	84.6	S.W.	4.09	....	11	3
For the year	....	....	....	....	....	....	....	....	....	....	....	....	....

* Including melted snow.
† Corrected for temperature and instrumental error only.

STATION, SANDY HOOK, N. J.

Latitude, 40° 28′ N.; Longitude, 74° W. Height of Barometer Cistern above Mean Sea Level, 28 feet.

OBSERVER, U. S. SIGNAL SERVICE.

	Barometer.†			Thermometer.				Mean Humidity.	Prevailing Wind.	Rain (Inches).*	Snow.	Days when Precipitation equaled 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.						
1882.													
July	30.509	29.526	29.998	92.0	60.0	73.0	....	73.3	S. E.	2.39	....	7	6
August	30.299	29.596	30.016	88.0	61.0	73.3	....	74.6	S. E.	2.95	....	8	7
September	30.344	29.548	30.021	87.0	52.5	65.6	....	79.0	N. E.	11.48	....	12	9
October	30.327	29.677	30.089	76.0	46.0	59.9	....	77.9	N. E.	2.16	....	11	9
November	30.533	29.410	30.125	68.0	24.0	43.0	....	73.1	N. E.	1.51	....	9	7
December	30.438	29.894	30.082	62.0	3.0	33.3	....	77.9	W.	2.66	....	7	7
1883.													
January	30.619	29.500	30.166	54.0	5.5	29.4	....	81.6	N. E.	2.35	....	10	14
February	30.750	29.604	30.228	56.0	16.0	32.6	....	79.8	N. W.	4.27	....	15	7
March	30.466	29.244	29.943	62.0	10.0	34.4	....	73.4	N. W.	1.45	....	6	5
April	30.455	29.600	29.993	66.0	27.0	46.6	....	73.4	N. E.	5.79	....	12	9
May	30.379	29.474	29.918	84.0	40.0	58.6	....	73.6	S. E.	4.66	....	11	7
June	30.474	29.575	29.986	90.0	50.0	70.3	....	77.1	S. W. & S. E.	4.94	....	11	8
For the year	....	....	....	....	....	....	....	....	....	....	....	....	....

* Including melted snow.
† Corrected for temperature and instrumental error only.

QUINQUENNIAL DEATH-RATES.

REMARKS ON THE QUINQUENNIAL DEATH-RATES AND COMPARISONS OF THE NEXT TABLE.

The following table is intended to present, in a condensed form, (*a*) the death-rate by counties, including cities; (*b*) the death-rate of cities without the counties, and (*c*) the death-rate of the counties without the cities, for the first quinquennial period of the vital statistics of the State, as ending July, 1883. In addition, it presents the proportion of deaths under five years of age in the counties, including the cities, and in the cities without their counties. Also, the proportion of the chief preventable diseases to the entire deaths for the five years in the counties, including the cities, and in the cities without their counties.

Quetelet gives four chief rules as to such statistics:

I. Never have preconceived ideas as to what the figures are to prove.

II. Never reject a number that seems contrary to what you might expect, merely because it departs a good deal from the apparent average.

III. Be careful to weigh and record all the possible causes of an event, and do not attribute to one what is really the result of the combination of several.

IV. Never compare data which have nothing in common.

The following table, although exceedingly valuable for comparison to those who will accept it as a generalization and deal with it as to be studied alongside of modifying facts, is capable of being used in a plausible and yet utterly misleading way. Yet, in general, these modifying considerations are not difficult to estimate. In all large cities, and in large counties, for instance, the statistics are most informatory, since we are dealing with so large an aggregate of population as to neutralize or reduce to a minimum what might otherwise be a dis-

turbing factor. Thus the facts as to Newark and Jersey City are for five years those which concern about 600,000 of population each. The same kind of a statement for five years, as to a city of 5,000, represents 25,000 people. Even this is very valuable, but in so small a number some temporary cause of mortality would affect the average rate more than in a very large population. Again, if a city is situated in a populous county with many small villages, the contrast between its death-rate and that of the county, will not be marked. Sometimes, as in Hudson county, the condition of the whole county is such, or the population of the county is so small, as compared with its cities, as that the death-rate of the county is higher than that of its combined cities. This does not necessarily prove that the county is more unhealthy than the cities, but leads us to inquire whether the smallness of the population is such as that some local influence in some one district, or some local mortality or some presence of city institutions, has not magnified the death-rate. If so, we are able to allow for this and still get guide from our tables.

Atlantic county has its death-rate made higher than it would be, by incidental circumstances—the county being affected by some local epidemic largely in proportion because of its small population, and Atlantic City appearing high because, for four months of the year, it has about an eight-fold population, which would give more than a two-fold average for the year, and so reduce the death-rate one-half. Yet this merely necessitates that the city and county should keep or have an accurate analysis as to the residence of those that die, should study indications and should await facts over a sufficient long period of time to give it the correction of large numbers. Often it is well for those in localities of county or city to reckon the general death-rate without that of their own district, and so see how even the general death-rate may be magnified by their own locality. Thus the average death-rate of the State is largely increased by that of Hudson, Essex and Passaic counties, and that of the two last counties by their cities. When health officers and other local students of causes come to study them, if they will do it without having started to prove the healthfulness of their district, they will be able, on the one hand, to account for what may seem a relatively high statement of mortality, and, on the other, to detect the causes which are producing an excessive death-rate.

Always, too, it is to be borne in mind that the number of births and

the number of children under five years, or from five to twenty years of age, modifies results. It is hoped that our semi-decennial census will enable us to know just how many there are in the State, or in localities, of those various ages.

In our study of these statistics we should have paid more attention to the increase and decrease of population, but that the five years embrace a period both before and after a decennial census, and so the population of that census was, for the time, a fair basis. It is not necessary to discuss, in detail, various matters in this table, but we place it on record for permanent reference and for the study of local statisticians, health officers and physicians, as it is of great value as a guide.

The following table shows the quinquennial death-rates under five years, and from the chief preventable diseases for period ending June 30th, 1883:

QUINQUENNIAL DEATH-RATES.

	DEATHS AT ALL AGES.						
	Death-rate by counties.	Death-rate by cities.	Death-rate of counties without cities.	Comparison death rate under 5 years by counties.	Comparison death-rate under 5 years by cities.	Comparison death-rate from chief preventable diseases by counties.	Comparison death-rate from chief preventable diseases by cities.
Atlantic county	18.48		15.80	41.03		20.26	
Atlantic City		22.24			*50 41		31.36
Bergen county	16.28		16.28	35 06		21 80	
Burlington county	15.91		13.24	34.84		21.82	
Bordentown		16.61			28.89		16.25
Burlington		19.31			31.18		20.17
Camden county	20.19		15.25	40.04		25.53	
Camden		20 58			41.35		30.21
Gloucester City		17.92			40.29		22.96
Cape May county	13 17		13.17	19.13		25 66	
Cumberland county	16.56		14.27	36 01		25.76	
Bridgeton		18 41			36.99		30.63
Millville		19.87			46.12		35.35
Essex county	21.26		13.63	40.61		27.66	
Newark		23.36			41 55		27 58
Orange		19.58			*43.46		24.13
Gloucester county	15.96		15.96	34.85		24 15	
Hudson county	24.79		31.90	45.58		29.82	
Bayonne		19.18			50.82		27.14
Harrison		20.12			44.67		30 40
Hoboken		25.58			49 07		32 21
Jersey City		24.26			45.31		30 04
Town of Union		27.11			53.59		41.23
Hunterdon county	13.74		13.74	28.94		20 49	
Mercer county	19.12		16.20	32.23		22 02	
Chambersburg		20 34			41.95		30 38
Trenton		20 54			37 89		22.92
Middlesex county	17.61		16.54	36.08		25.74	
New Brunswick		19 76			41.98		30.66
Monmouth county	17.12		17 12	35.25		22.49	
Morris county	17.04		13.76	32.32		22.22	
Morristown		19.59			29.25		19.25
Ocean county	13.82		13.82	31.53		20.82	
Passaic county	22.54		10 53	42.57		28.53	
Passaic		20 82			50.59		29 41
Paterson		24.51			43 08		28.92
Salem county	16 08		15.21	33.28		21.86	
Salem		18.91			33 05		19.87
Somerset county	15 68		15.68	28.92		21.31	
Sussex county	14.48		14 48	26.35		22 06	
Union county	18.59		14.65	38.37		25.73	
Elizabeth		19.65			42.57		22.21
Plainfield		16 49			39.10		25 22
Rahway		21.78			32 57		19.77
Warren county	16.34		12.21	36.49		22 11	
Phillipsburg		18.33			48.48		30.32
Totals	19.45	20 23	14.62	38.69	42.93	26.09	28.43

* See remarks as to health resorts, high birth-rate, etc.

NUMBER OF MARRIAGES, BIRTHS AND DEATHS BY TOWNSHIPS

FOR THE YEAR ENDING JUNE 30, [illegible]

ATLANTIC COUNTY

	[illegible]	[illegible]	[illegible]
Absecon	[illegible]	[illegible]	[illegible]
Atlantic City	[illegible]	[illegible]	[illegible]
Buena Vista	[illegible]	[illegible]	[illegible]
Egg Harbor City	[illegible]	[illegible]	[illegible]
Egg Harbor Township	[illegible]	[illegible]	[illegible]
Galloway	[illegible]	[illegible]	[illegible]
Hamilton	[illegible]	[illegible]	[illegible]
Hammonton	[illegible]	[illegible]	[illegible]
Mullica	[illegible]	[illegible]	[illegible]
Weymouth	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]

BERGEN COUNTY

	[illegible]	[illegible]	[illegible]
Englewood	[illegible]	[illegible]	[illegible]
Franklin	[illegible]	[illegible]	[illegible]
Harrington	[illegible]	[illegible]	[illegible]
Hohokus	[illegible]	[illegible]	[illegible]
Lodi	[illegible]	[illegible]	[illegible]
Midland	[illegible]	[illegible]	[illegible]
New Barbadoes	[illegible]	[illegible]	[illegible]
Palisades	[illegible]	[illegible]	[illegible]
Ridgefield	[illegible]	[illegible]	[illegible]
Ridgewood	[illegible]	[illegible]	[illegible]
Saddle River	[illegible]	[illegible]	[illegible]
Union	[illegible]	[illegible]	[illegible]
Washington	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]

BURLINGTON COUNTY.

	M.	B.	D.
Bass River	4	29	11
Beverly	14	19	49
Bordentown	40	138	105
Burlington City	58	144	137
Chester	30	62	30
Chesterfield	6	30	17
Cinnaminson	19	56	24
Delran	21	17	28
Eastampton	2	17	10
Evesham	5	38	18
Florence	8	44	15
Little Egg Harbor	16	46	17
Lumberton	....	30	5
Mansfield	11	40	21
Medford	16	42	28
Mt. Laurel	....	20	27
New Hanover	10	43	31
Northampton	70	96	113
Pemberton	22	43	42
Randolph	4	9	7
Shamong	2	9	9
Southampton	9	54	21
Springfield	3	34	28
Washington	1	10	8
Westampton	2	5	6
Willingboro	....	9	10
Woodland	....	....	3
	373	1,061	810

CAMDEN COUNTY.

	M.	B.	D.
Camden City	496	807	932
Centre	8	49	41
Delaware	....	15	16
Gloucester City	39	145	116
Gloucester	17	60	66
Haddon	20	65	33
Stockton	13	68	87
Waterford	9	43	25
Winslow	14	52	25
	618	1,299	1,291

CAPE MAY COUNTY.

	M.	B.	D.
Cape May City	16	44	31
Dennis	15	52	14
Lower	9	35	38
Middle	21	62	35
Upper	17	28	31
	78	221	144

CUMBERLAND COUNTY.

	M.	B.	D.
Bridgeton	118	242	163
Commercial	14	17	33
Deerfield	13	28	15
Downe	[illegible]	26	24
Fairfield	16	74	35
Greenwich	6	21	18
Hopewell	12	42	30
Landis	65	136	117
Maurice River	16	55	22
Millville	100	240	142
Stoe Creek	5	12	10
	379	892	609

ESSEX COUNTY.

	M.	B.	D.
Belleville	15	48	48
Bloomfield	42	114	83
Caldwell	20	45	42
Clinton	11	[illegible]	36
East Orange	46	215	106
Franklin	6	30	[illegible]
Livingston	9	8	9
Milburn	7	44	19
Montclair	26	154	82
Newark	1,257	3,889	3,372
Orange	99	380	291
South Orange	14	66	51
West Orange	14	86	51
	1,566	5,137	4,211

GLOUCESTER COUNTY.

	M.	B.	D.
Clayton	18	59	28
Deptford	2	38	24
East Greenwich	3	14	15
Franklin	11	58	33
Glassboro	23	75	43
Greenwich	11	38	26
Harrison	10	41	19
Logan	4	33	27
Mantua	11	35	32
Monroe	12	47	39
South Harrison	4	16	12
Washington	12	34	24
West Deptford	8	29	29
Woodbury	28	69	47
Woolwich	20	64	40
	165	640	427

HUDSON COUNTY.

	M.	B.	D.
Bayonne	66	229	208
Guttenberg	12	88	33
Harrison	20	198	152
Hoboken	365	961	706
Jersey City	989	1,841	3,041
Kearny	6	44	85
North Bergen	15	42	218
Town of Union	92	226	187
Union	7	44	28
Weehawken	1	19	25
West Hoboken	58	202	111
	1,631	3,844	4,694

HUNTERDON COUNTY.

	M.	B.	D.
Alexandria	6	14	17
Bethlehem	10	48	35
Clinton	7	39	19
Delaware	15	48	43
East Amwell	15	25	20
Franklin	18	28	12
Frenchtown	9	21	14
High Bridge	17	41	23
Holland	15	34	19
Kingwood	8	33	15
Lambertville	32	71	39
Lebanon	21	49	33
Raritan	32	47	50
Readington	12	58	35
Tewksbury	24	39	25
Town of Clinton	10	26	16
Union	9	6	6
West Amwell	1	22	7
	256	634	429

MERCER COUNTY.

	M.	B.	D.
Chambersburg	42	183	124
East Windsor	19	39	22
Ewing	4	15	72
Hamilton	7	44	57
Hopewell	33	68	54
Lawrence	8	27	22
Millham	5	57	38
Princeton	13	71	72
Trenton	360	636	682
Washington	4	27	14
West Windsor	7	24	17
	497	1,191	1,124

MIDDLESEX COUNTY.

	M	B	D
Cranbury	[illegible]	[illegible]	[illegible]
East Brunswick	[illegible]	[illegible]	[illegible]
Madison	[illegible]	[illegible]	[illegible]
Monroe	[illegible]	[illegible]	[illegible]
New Brunswick	[illegible]	[illegible]	[illegible]
North Brunswick	[illegible]	[illegible]	[illegible]
Perth Amboy	[illegible]	[illegible]	[illegible]
Piscataway	[illegible]	[illegible]	[illegible]
Raritan	[illegible]	[illegible]	[illegible]
Sayreville	[illegible]	[illegible]	[illegible]
South Amboy	[illegible]	[illegible]	[illegible]
South Brunswick	[illegible]	[illegible]	[illegible]
Woodbridge	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]

MONMOUTH COUNTY.

	[illegible]	[illegible]	[illegible]
Atlantic	[illegible]	[illegible]	[illegible]
Eatontown	[illegible]	[illegible]	[illegible]
Freehold	[illegible]	[illegible]	[illegible]
Holmdel	[illegible]	[illegible]	[illegible]
Howell	[illegible]	[illegible]	[illegible]
Manalapan	[illegible]	[illegible]	[illegible]
Marlboro	[illegible]	[illegible]	[illegible]
Matawan	[illegible]	[illegible]	[illegible]
Middletown	[illegible]	[illegible]	[illegible]
Millstone	[illegible]	[illegible]	[illegible]
Neptune	[illegible]	[illegible]	[illegible]
Ocean	[illegible]	[illegible]	[illegible]
Raritan	[illegible]	[illegible]	[illegible]
Shrewsbury	[illegible]	[illegible]	[illegible]
Upper Freehold	[illegible]	[illegible]	[illegible]
Wall	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]

MORRIS COUNTY.

	[illegible]	[illegible]	[illegible]
Boonton	[illegible]	[illegible]	[illegible]
Chatham	[illegible]	[illegible]	[illegible]
Chester	[illegible]	[illegible]	[illegible]
Hanover	[illegible]	[illegible]	[illegible]
Jefferson	[illegible]	[illegible]	[illegible]
Mendham	[illegible]	[illegible]	[illegible]
Montville	[illegible]	[illegible]	[illegible]
Morristown	[illegible]	[illegible]	[illegible]
Mt. Olive	[illegible]	[illegible]	[illegible]
Passaic	[illegible]	[illegible]	[illegible]
Pequannock	[illegible]	[illegible]	[illegible]
Randolph	[illegible]	[illegible]	[illegible]
Rockaway	[illegible]	[illegible]	[illegible]
Roxbury	[illegible]	[illegible]	[illegible]
Washington	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]

OCEAN COUNTY.

	M.	B.	D.
Berkeley	1	15	8
Brick	19	87	56
Dover	24	45	37
Eagleswood	9	8	8
Jackson	11	39	29
Lacey	5	22	14
Manchester	4	31	14
Ocean	8	9	11
Plumstead	18	48	28
Stafford	7	10	19
Union	11	24	9
	112	338	226

PASSAIC COUNTY.

	M.	B.	D.
Acquackanonk	4	29	26
Little Falls	7	28	18
Manchester	1	18	12
Passaic	71	194	154
Paterson	469	1,641	1,446
Pompton	11	84	82
Wayne	4	22	7
West Milford	17	16	26
	584	1,972	1,719

SALEM COUNTY.

	M.	B.	D.
Alloway	8	39	28
Elsinboro		8	11
Lower Alloways Creek	1	26	28
Lower Penn's Neck	10	12	16
Mannington	4	26	37
Oldmans	19	35	17
Pilesgrove	21	70	60
Pittsgrove	10	68	25
Quinton	3	43	23
Salem	44	126	78
Upper Penn's Neck	19	29	36
Upper Pittsgrove	19	16	22
	158	493	376

NUMBER OF MARRIAGES, BIRTHS AND DEATHS, BY TOWNSHIPS.

FOR THE YEAR ENDING JUNE 30, 1884.

ATLANTIC COUNTY.

	M.	B.	D.
Absecon	6	18	6
Atlantic City	74	156	178
Buena Vista	1	15	10
Egg Harbor City	31	30	32
Egg Harbor Township	35	79	48
Galloway	11	36	27
Hamilton	7	34	27
Hammonton	24	57	47
Mullica	2	12	5
Weymouth	2	17	7
	193	449	387

BERGEN COUNTY.

	M.	B.	D.
Englewood	20	39	61
Franklin	21	44	36
Harrington	16	41	33
Hohokus	20	43	24
Lodi	15	79	71
Midland	8	20	80
New Barbadoes	47	95	68
Palisade	18	20	19
Ridgefield	9	66	65
Ridgewood	15	29	22
Saddle River	2	21	24
Union	10	78	48
Washington	4	54	34
	200	629	585

WARREN COUNTY.

	M.	B.	D.
Allamuchy	....	13	6
Belvidere	15	89	32
Blairstown	7	43	13
Franklin	10	30	15
Frelinghuysen	3	16	7
Greenwich	8	26	15
Hackettstown	26	59	36
Hardwick	....	8	6
Harmony	4	33	18
Hope	11	39	17
Independence	8	13	5
Knowlton	6	26	24
Lopatcong	2	42	14
Mansfield	9	15	27
Oxford	28	156	51
Pahaquarry	1	6	8
Phillipsburg	58	265	130
Pohatcong	7	34	20
Washington Borough	32	52	32
Washington Township	3	23	13
	238	938	489

TOTALS OF MARRIAGES, BIRTHS AND DEATHS FOR ALL THE COUNTIES.

	M.	B.	D.
Atlantic	193	449	387
Bergen	200	629	585
Burlington	373	1,061	810
Camden	618	1,299	1,291
Cape May	78	221	144
Cumberland	379	892	609
Essex	1,566	5,137	4,211
Gloucester	165	640	426
Hudson	1,631	3,844	4,694
Hunterdon	256	634	429
Mercer	497	1,191	1,124
Middlesex	384	1,214	978
Monmouth	492	1,268	858
Morris	297	962	748
Ocean	112	338	226
Passaic	584	1,972	1,719
Salem	158	493	376
Somerset	163	446	348
Sussex	168	234	293
Union	416	1,401	1,021
Warren	238	938	489
	8 968	25,263	21,716

CUMBERLAND COUNTY.

	M.	B.	D.
Bridgeton	118	242	168
Commercial	14	17	33
Deerfield	18	28	15
Downe	12	26	24
Fairfield	18	74	35
Greenwich	6	21	18
Hopewell	12	42	30
Landis	65	135	117
Maurice River	16	55	22
Millville	100	240	142
Stoe Creek	5	12	10
	379	892	609

ESSEX COUNTY.

	M.	B.	D.
Belleville	15	48	43
Bloomfield	42	114	83
Caldwell	20	45	42
Clinton	11	58	36
East Orange	46	215	105
Franklin	6	30	27
Livingston	9	8	9
Milburn	7	44	19
Montclair	26	154	82
Newark	1,257	3,889	3,372
Orange	99	380	291
South Orange	14	66	51
West Orange	14	86	51
	1,566	5.137	4.211

GLOUCESTER COUNTY.

	M.	B.	D.
Clayton	13	50	28
Deptford	2	33	24
East Greenwich	3	14	15
Franklin	11	58	33
Glassboro	23	75	43
Greenwich	11	38	25
Harrison	10	41	19
Logan	4	33	27
Mantua	11	35	32
Monroe	12	47	30
South Harrison	4	16	12
Washington	12	34	24
West Deptford	3	29	29
Woodbury	26	69	47
Woolwich	20	54	40
	165	640	427

Return of Deaths from all Causes and Certain Specified Diseases, in the Cities of the State of New Jersey, of over 5,000 Population, for the Year ending June 30th, 1884.

CITIES HAVING OVER 5,000 POPULATION. Statistical Divisions.	DEATH AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.
Atlantic County.										
Atlantic City	59	17	26	50	26	178	5,477	32.50	42.70	......
Burlington County										
Bordentown	15	10	13	36	30	106	5,334	19.66	23.81	......
Burlington	36	11	7	42	37	137	7,237	18.93	36.50	1
Camden County.										
Camden	261	121	78	290	162	932	41,659	22.37	41.31	7
Gloucester City	32	14	13	46	8	116	5,347	21.69	39.65	2
Cumberland Co.										
Bridgeton	33	26	11	48	44	163	8,722	18.69	36.20	......
Millville	38	8	13	45	38	142	7,660	18.54	32.39	1
Essex County.										
Newark	836	503	295	1147	580	3,372	136,508	24.70	39.71	28
Orange	81	41	25	103	38	291	13,207	22.03	42.95	1
Hudson County.										
Bayonne	55	32	19	80	22	208	9,372	22.19	41.83	1
Harrison	39	17	13	66	17	152	6,898	22.03	36.84	5
Hoboken	205	84	62	283	68	706	30,999	22.13	41.36	2
Jersey City	794	473	277	1061	404	3 036	120,722	25.10	41.73	37
Town of Union	43	22	8	45	20	137	5,849	23.42	47.44	2
Mercer County.										
Chambersburg	36	27	8	37	14	124	5,437	22.81	50.81	2
Trenton	131	119	66	192	107	632	29,910	21.13	39.56	3
Middlesex County.										
New Brunswick	81	66	69	109	66	397	17,166	23.13	36.77	2
Morris County.										
Morristown	27	17	9	44	42	142	6,837	20.77	30.98	......
Passaic County.										
Passaic	41	12	16	56	27	154	6,532	23.58	34.41	......
Paterson	263	280	141	403	250	1,446	51,031	28.33	44.47	12
Salem County.										
Salem	23	5	6	24	18	78	5,056	15.43	35.90	2
Union County.										
Elizabeth	164	55	69	177	96	691	28,229	20.93	42.13	11
Plainfield	32	10	16	39	35	132	8,125	16.25	31.82	1
Rahway	28	11	13	31	33	111	6,455	17.19	30.63	1
Warren County.										
Phillipsburg	40	16	10	42	22	130	7,181	18.10	43.08	......
Total	3497	2029	1281	4516	2206	13,612	576,950	23.59	40.61	121

CITIES HAVING OVER 5,000 POPULATION. Statistical Divisions.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrhœal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of Children.	Diseases of heart and circulat'n.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intest'l diseases.	Cancer.	Ac'te rheumatism.	Consumption. M.	Consumption. F.	Comparative number of deaths of chief preventable diseases.
Atlantic County.																				
Atlantic City	5	...	7	......	1	4	24	......	10	16	13	12	12	...	6	8	......	16	7	23.03
Burlington County																				
Bordentown	4	...	12	....	.....	3	7	3	10	3	9	1	17	...	11	1	......	3	7	24.76
Burlington	3	...	1	...	.....	7	19	....	7	5	13	13	14	...	7	2	......	10	9	22.63
Camden County.																				
Camden	34	3	28	3	10	44	101	11	74	66	50	23	51	4	47	17	1	65	79	25.11
Gloucester City	6	...	10	....	5	3	8	2	8	5	6	4	5	...	4	1	......	7	13	29.31
Cumberland Co.																				
Bridgeton	4	...	2	....	1	5	23	1	20	10	11	8	5	1	12	2	......	14	18	22.08
Millville	4	...	2	.....	....	2	13	4	15	8	5	3	9	...	10	3	......	12	18	15.49
Essex County.																				
Newark	87	...	79	46	6	176	402	29	407	284	183	162	215	6	140	82	1	276	210	24.67
Orange	8	...	12	1	1	15	35	4	31	25	12	11	8	3	15	5	......	31	23	26.12
Hudson County.																				
Bayonne	15	...	1	....	......	12	32	3	16	18	11	7	11	1	6	1	1	12	10	29.81
Harrison	9	...	3	1	....	9	15	1	19	21	7	2	7	...	5	4	1	14	11	27.63
Hoboken	24	...	12	5	1	23	95	12	65	78	46	25	29	2	37	10	7	44	59	23.23
Jersey City	116	...	63	45	20	122	425	25	354	240	158	106	157	6	137	61	7	209	209	27.47
Town of Union	8	...	1	.....	2	5	32	2	11	6	10	3	9	1	4	3	3	14	5	37.23
Mercer County.																				
Chambersburg	......	..	7	1	1	7	26	3	8	8	9	2	9	...	3	7	......	7	12	35.48
Trenton	21	...	33	2	14	61	62	9	44	31	32	18	52	3	34	18	1	51	42	31.49
Middlesex County.																				
New Brunswick	14	...	7	2	....	66	51	4	27	28	18	27	21	...	16	11	2	26	27	35.77
Morris County.																				
Morristown	3	...	......	......	......	11	11	1	6	14	15	5	14	...	5	7	......	8	19	17.60
Passaic County.																				
Passaic	6	...	1	1	....	6	16	......	22	21	8	5	8	1	9	2	......	12	18	20.13
Paterson	34	...	66	43	10	82	185	8	156	127	59	75	64	6	61	24	2	121	106	30.43
Salem County.																				
Salem	1	1	2	....	......	....	12	2	5	2	4	2	5	...	7	2	1	6	10	28.06
Union County.																				
Elizabeth	13	...	22	.....	......	42	76	6	47	57	42	28	41	1	30	13	1	31	35	27.92
Plainfield	4	...	2	.....	......	11	15	......	6	10	9	9	18	...	5	......	......	5	10	25.00
Rahway	4	....	3	.....	.....	2	11	......	11	9	11	4	10	1	3	1	1	6	8	19.82
Warren County.																				
Phillipsburg	4	...	1	......	......	7	16	1	6	14	7	6	12	1	5	3	......	6	12	23.31
Total	431	4	369	152	72	725	1712	131	1416	1,110	746	556	[illegible]	87	609	298	29	1009	967	28.62

Total of consumption for all cities as compared with total deaths, 14.66.

MIDDLESEX COUNTY.

	M.	B.	D.
Cranbury	24	28	17
East Brunswick	23	82	59
Madison	1	15	11
Monroe	13	26	13
New Brunswick	149	462	397
North Brunswick	2	28	24
Perth Amboy	66	223	150
Piscataway	28	64	48
Raritan	16	39	47
Sayreville	14	18	28
South Amboy	33	98	76
South Brunswick	6	45	41
Woodbridge	9	91	72
	384	1,214	978

MONMOUTH COUNTY.

	M.	B.	D.
Atlantic	6	16	18
Eatontown	24	58	86
Freehold	46	72	70
Holmdel	9	26	14
Howell	25	74	85
Manalapan	12	84	17
Marlboro	6	24	21
Matawan	29	55	58
Middletown	15	78	74
Millstone	11	26	25
Neptune	79	141	125
Ocean	71	212	92
Raritan	85	86	68
Shrewsbury	64	157	110
Upper Freehold	26	71	46
Wall	41	145	59
	492	1,268	858

MORRIS COUNTY.

	M.	B.	D.
Boonton	23	54	50
Chatham	33	49	64
Chester	11	79	21
Hanover	12	56	108
Jefferson	....	16	19
Mendham	9	17	23
Montville	2	16	14
Morristown	54	165	142
Mt. Olive	17	37	21
Passaic	11	21	23
Pequannock	9	53	82
Randolph	47	189	94
Rockaway	29	95	90
Roxbury	18	43	21
Washington	22	72	81
	297	962	748

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

BERGEN COUNTY. POPULATION, 36,786. Statistical Divisions.	DEATHS AT ALL AGES.									PRINCIPAL CAUSES OF DEATH.																			
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five to comparison with total deaths.	Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Englewood	10	8	5	20	18	61	4,076	......	......	4	1	......	3	......	......	1	6	1	6	3	6	1	6	......	3	1	......	4	7
Franklin	5	8	3	10	10	36	2,206	......	......	3	......	......	......	1	1	3	2	1	2	2	2	1	3	......	3	......	......	3	2
Harrington	6	......	4	10	13	33	2,770	......	......	......	1	......	......	......	......	......	3	......	......	......	3	4	6	1	3	1	......	1	2
Hohokus	4	1	1	8	10	24	2,920	......	......	1	......	......	......	......	......	1	......	......	2	1	2	......	1	......	2	2	......	2	4
Lodi	17	10	4	18	22	71	4,071	......	......	......	6	......	......	......	......	2	11	1	11	5	5	......	7	......	6	1	......	8	3
Midland	5	1	7	11	6	30	1,591	......	......	2	3	......	......	......	......	3	1	......	6	1	1	2	1	......	2	......	......	3	2
New Barbadoes	15	8	6	26	13	68	4,258	......	......	1	3	......	1	......	1	3	6	3	10	4	3	4	5	2	1	2	......	3	4
Palisade	2	2	1	6	8	19	2,302	......	......	1	2	......	......	......	......	1	2	......	......	1	3	2	2	......	......	......	......	2	1
Ridgefield	22	4	6	20	13	65	3,952	......	......	2	......	......	1	......	......	1	9	3	6	6	3	2	2	......	6	......	......	2	4
Ridgewood	4	2	1	8	6	22	1,476	......	......	1	......	......	......	......	......	......	3	......	2	2	2	......	......	......	1	2	......	1	4
Saddle River	4	2	2	6	10	24	1,355	......	......	2	......	......	......	......	......	......	1	......	3	3	......	1	6	......	2	1	......	2	......
Union	12	5	5	17	9	48	3,164	......	......	1	......	......	1	......	1	2	4	......	4	3	1	3	6	......	4	......	......	3	3
Washington	4	3	1	11	15	34	2,853	......	......	1	3	......	......	......	......	1	3	......	5	1	1	3	4	1	4	......	......	2	1
Totals	110	54	46	171	152	535	35,746	14.94	......	19	18	......	6	1	3	18	50	9	60	38	31	23	47	4	36	10	......	31	36

SOMERSET COUNTY.

	M.	B.	D.
Bedminster	8	26	28
Bernards	18	34	32
Branchburg	4	21	18
Bridgewater	50	155	104
Franklin	17	65	47
Hillsborough	19	40	42
Montgomery	8	36	28
North Plainfield	30	58	35
Warren	9	11	14
	163	446	348

SUSSEX COUNTY.

	M.	B.	D.
Andover	7	17	12
Byram	18	17	21
Frankford	14	15	27
Green	6	18	9
Hardyston	16	5	33
Hampton	6	2	19
Lafayette	12	3	10
Montague	1	6	2
Newton	26	30	38
Sandyston	6	11	11
Sparta	16	18	19
Stillwater	7	31	15
Vernon	9	31	22
Walpack	5	18	5
Wantage	24	27	50
	168	284	293

UNION COUNTY.

	M.	B.	D.
Clark	....	2	....
Cranford	4	20	19
Elizabeth	263	925	591
Fanwood	4	18	11
Linden	10	28	28
New Providence	4	11	20
Plainfield	31	168	132
Rahway	58	97	111
Springfield	7	14	9
Summit	20	41	32
Union	8	35	33
Westfield	7	47	36
	416	1,401	1,021

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

CAMDEN COUNTY. POPULATION, 62,942. Statistical Divisions.	DEATHS AT ALL AGES.									PRINCIPAL CAUSES OF DEATH.																			
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism	Consumption—male.	Consumption—female.
* Camden	264	121	78	290	162	932	41,639	22.37	....	7	34	3	28	3	10	44	101	11	74	66	50	23	51	4	47	17	1	65	79
Center	11	6	5	7	9	41	1,532	....	....	1	3	......	......	......	......	......	8	......	4	3	5	1	1	......	3	......	......	2	2
Delaware	2	......	1	8	5	16	1,481	....	....	......	......	......	......	......	......	......	......	1	5	......	1	......	2	......	......	......	......	1	1
Gloucester City	32	14	13	46	8	116	5,347	21.69	....	2	6	......	10	......	5	3	8	2	8	5	6	4	5	......	4	1	......	7	13
Gloucester	17	2	2	27	17	66	2,527	....	....	2	1	......	2	......	......	1	8	......	4	3	7	2	7	1	5	1	......	3	7
Haddon	5	2	3	10	13	33	2,551	....	....	......	2	......	3	......	......	......	3	......	4	......	3	3	6	......	3	......	......	......	2
Stockton	8	8	1	14	6	37	3,532	....	....	......	3	......	1	......	1	4	2	......	5	3	1	......	4	......	1	......	......	3	5
Waterford	3	5	......	10	7	25	2,149	....	....	......	1	......	1	......	......	1	2	......	5	......	1	3	3	......	......	......	......	3	3
Winslow	7	4	1	8	5	25	2,158	....	....	......	......	......	......	......	......	......	2	......	2	2	2	......	......	......	1	......	1	6	3
Totals	349	162	104	420	232	1,291	62,942	20.51	....	12	50	3	45	3	16	53	134	14	111	82	76	36	79	5	64	19	2	90	115

* Cities are generally more unhealthy than their death-rates indicate, since the population is in many of them much decreased for four months in the year, and thousands remove themselves instead of removing the evils which distress and sicken those who remain. Hence, in many of our cities, the death-rate for June, July, August and September, reckoned for the remaining population, would be a fair criterion of the health of locality, or at least should be considered for purposes of correction. So health laws are a great defense to all, but especially to the working classes of cities. See page 330.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

COUNTIES. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total.	Population, Census of 1880.	Death-rate per 1,000.	Death-rates without cities of over 5,000.	Deaths under five in comparison with total deaths.
Atlantic	128	41	40	98	80	387	16,704	20.69	15.80	43.67
Bergen	110	84	46	171	152	535	36,786	14.54	14.51	30.65
Burlington	169	69	75	237	261	809	55,403	14.60	13.24	29.18
Camden	349	162	104	420	232	1,291	62,942	20.51	15.25	39.58
Cape May	32	13	10	36	53	144	9,765	14.75	14.75	31.25
Cumberland	141	65	46	175	178	609	37,687	16.16	14.27	33.82
Essex	1020	614	368	1453	751	4,211	189,929	22.17	13.63	39.80
Gloucester	78	50	36	133	122	427	25,886	16.49	16.49	29.51
Hudson	1257	686	413	1711	613	4,689	187,944	24.95	31.90	41.44
Hunterdon	66	32	39	125	165	429	38,570	11.12	11.12	22.84
Mercer	217	174	114	340	283	1,124	58,061	19.36	14.20	34.79
Middlesex	190	162	138	288	186	978	52,286	18.70	16.54	35.99
Monmouth	212	85	63	260	210	855	55,538	15.45	15.45	33.15
Morris	142	87	60	237	222	748	50,861	14.71	13.76	30.61
Ocean	44	22	16	69	71	226	14,456	15.63	15.63	29.30
Passaic	430	301	171	502	304	1,719	68,860	24.96	10.53	42.52
Salem	97	33	35	101	111	376	24,579	15.30	15.21	32.71
Somerset	50	38	29	125	116	348	27,162	12.81	12.81	21.87
Sussex	34	14	23	96	102	293	23,539	12.44	12.44	23.21
Union	252	124	118	300	226	1,021	55,571	18.37	14.85	36.83
Warren	104	44	49	152	157	459	35,589	13.36	12.21	30.98
Total	*5123	2846	1995	7007	4083	21,716	1,131,117	19.20	14.62	36.70

COUNTIES.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.	Comparative number of deaths from chief preventable diseases.
Atlantic	......	7	...	14	......	2	8	52	4	25	31	20	19	22	......	17	11	......	32	27	21.45
Bergen	19	18	...	6	1	3	18	50	9	60	33	31	21	47	4	36	10	......	31	36	22.21
Burlington	8	25	2	27	1	3	32	90	10	62	34	69	39	79	3	61	18	4	45	70	23.48
Camden	12	50	3	45	3	16	55	154	14	111	82	76	35	79	5	64	19	2	90	115	24.86
Cape May	......	1	...	5	......	......	3	16	2	16	7	13	2	17	......	12	6	......	11	10	17.36
Cumberland	2	17	...	6	1	2	13	64	10	57	49	36	30	65	3	47	13	......	41	57	17.73
Essex	54	113	...	99	63	16	226	466	39	465	347	237	194	274	13	152	103	4	333	279	24.60
Gloucester	4	10	...	19	1	3	5	24	4	33	26	24	16	36	2	35	8	......	33	27	16.97
Hudson	56	180	...	68	54	24	196	649	46	537	399	253	165	217	13	207	88	15	333	336	26.85
Hunterdon	4	2	1	10	2	1	13	22	7	49	15	35	23	60	4	26	12	......	26	43	13.75
Mercer	9	25	...	49	4	16	90	113	13	76	86	75	31	132	7	40	37	7	83	83	27.85
Middlesex	8	31	...	35	18	1	109	110	10	66	67	47	56	66	......	52	24	3	63	76	31.39
Monmouth	16	19	...	9	2	5	20	95	7	95	69	58	40	71	3	35	15	5	64	66	19.58
Morris	10	18	...	7	4	11	29	57	7	80	47	57	30	115	5	40	21	3	40	57	18.85
Ocean	2	9	...	3	1	2	4	16	1	20	14	11	7	22	3	16	10	2	6	26	15.14
Passaic	15	44	...	70	46	11	90	212	8	193	157	76	63	85	7	77	28	2	139	139	35.79
Salem	6	16	1	4	4	2	16	55	3	23	13	17	15	34	......	22	7	2	32	38	27.92
Somerset	3	7	...	11	1	1	11	18	9	24	30	27	18	48	1	18	14	3	32	24	15.23
Sussex	4	7	...	2	......	2	8	36	2	43	11	21	9	37	4	23	7	1	33	31	14.09
Union	16	26	...	33	......	......	62	127	9	78	67	77	45	67	2	50	18	2	68	64	26.06
Warren	2	12	...	5	......	......	18	36	7	44	44	34	22	50	2	23	17	4	32	45	15.31
Total	230	640	7	547	189	116	1027	2462	221	2174	1596	1324	892	1664	80	1075	484	62	1357	1658	24.40

* Of those that died under one year, 1,495 died under one month, of which 996 died in the larger cities.

Total deaths from consumption for the State, as compared with total deaths, 14.80.

Rates for short periods, or which deal with small numbers, are only approximate, since temporary causes may have been in operation, and small numbers do not eliminate or balance errors which practically disappear in large aggregates. So, five or ten years analyses are more important than any single year. The number of deaths before twenty, in proportion to the rest, are much more informatory as to local causes affecting health, than the total deaths. So, also, the number dying from the zymotic diseases, and especially from fevers, croup, diphtheria, diarrheal diseases, consumption, and brain and nervous diseases of children.

Return of Deaths from all Causes and Certain Specified Diseases, in the Cities of the State of New Jersey, of over 5,000 Population, for the Year ending June 30th, 1884.

CITIES HAVING OVER 5,000 POPULATION. Statistical Divisions.	DEATH AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.
Atlantic County.									
Atlantic City	59	17	26	50	26	178	5,477	32.50	42.70
Burlington County									
Bordentown	15	10	13	36	30	105	5,334	19.66	23.81
Burlington	39	11	7	42	37	137	7,237	18.93	36.50
Camden County.									
Camden	264	121	78	290	162	932	41,659	22.37	41.31
Gloucester City	32	14	13	46	8	116	5,347	21.69	39.65
Cumberland Co.									
Bridgeton	33	26	11	48	44	163	8,722	18.69	36.20
Millville	38	8	13	45	38	142	7,660	18.54	32.39
Essex County.									
Newark	836	503	295	1147	580	3,372	136,508	24.70	39.71
Orange	81	44	25	103	38	291	13,207	22.03	42.95
Hudson County.									
Bayonne	55	32	19	80	22	208	9,372	22.19	41.83
Harrison	39	17	13	66	17	152	6,898	22.03	36.84
Hoboken	209	84	62	283	68	706	30,999	22.13	41.36
Jersey City	794	473	277	1061	404	3 036	120,722	25.15	41.73
Town of Union	43	22	6	45	20	137	5,849	23.42	47.44
Mercer County.									
Chambersburg	36	27	8	37	14	124	5,437	22.81	50.81
Trenton	131	119	68	192	107	632	29,910	21.13	39.56
Middlesex County.									
New Brunswick	81	65	69	109	68	397	17,166	23.13	36.77
Morris County.									
Morristown	27	17	9	44	42	142	6,837	20.77	30.98
Passaic County.									
Passaic	41	12	16	56	27	154	6,532	23.58	34.41
Paterson	363	280	141	403	280	1,446	51,031	28.33	44.47
Salem County.									
Salem	23	5	6	34	18	78	5,056	15.43	35.90
Union County.									
Elizabeth	164	85	69	177	96	591	28,229	20.93	42.13
Plainfield	32	10	16	39	35	132	8,125	16.25	31.82
Rahway	23	11	13	31	33	111	6,456	17.19	30.63
Warren County.									
Phillipsburg	40	16	10	42	22	130	7,181	18.10	43.06
Total	3497	2029	1291	4516	2206	13,612	576,950	23.50	40.61

Statistical Divisions.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of Children.	Diseases of heart and circulat'n.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intest'l diseases.	Cancer.	Ac'te rheumatism.	Consumption. M.	Consumption. F.	Comparative number of deaths of chief preventable diseases.
Atlantic County.																					
Atlantic City	......	5	...	7	......	1	4	24	......	10	16	13	12	12	...	6	8	......	16	7	23.03
Burlington County																					
Bordentown	......	4	...	12	.....	......	3	7	3	10	3	9	1	17	...	11	1	......	3	7	24.76
Burlington	1	3	...	1	...	.....	7	19	....	7	5	13	13	14	...	7	2	......	10	9	22.63
Camden County.																					
Camden	7	34	3	28	3	10	44	101	11	74	66	50	23	51	4	47	17	1	65	79	25.11
Gloucester City	2	6	...	10	.....	5	3	8	2	8	5	6	4	5	...	4	1	.....	7	13	29.31
Cumberland Co.																					
Bridgeton	......	4	...	2	.....	1	5	23	1	20	10	11	8	8	1	12	2	......	14	18	22.06
Millville	1	4	...	2	.....	....	2	13	4	15	8	5	3	9	...	10	3	.....	12	18	15.49
Essex County.																					
Newark	25	67	...	79	43	6	176	402	29	407	284	183	162	215	6	140	82	1	276	210	24.67
Orange	1	8	...	12	1	1	15	35	4	31	25	12	11	8	3	15	5	......	31	23	26.12
Hudson County.																					
Bayonne	1	15	...	1	....	......	12	32	3	16	18	11	7	11	1	6	1	1	12	15	29.81
Harrison	5	9	...	3	1	....	9	15	1	19	21	7	2	7	...	5	4	1	14	11	27.63
Hoboken	2	24	...	12	5	1	23	93	12	65	78	46	20	29	2	37	10	7	44	59	23.23
Jersey City	37	118	...	63	45	20	122	425	25	384	240	153	106	157	6	137	61	7	209	209	27.47
Town of Union	2	6	...	1	.....	2	5	32	2	11	8	10	3	9	1	4	3	2	14	8	37.23
Mercer County.																					
Chambersburg	2	......	..	7	1	1	7	26	3	8	8	9	2	9	...	3	7	......	7	12	35.46
Trenton	3	21	...	33	2	14	61	62	9	44	31	32	18	53	3	34	18	1	51	42	31.49
Middlesex County.																					
New Brunswick	2	14	...	7	2	....	66	51	4	27	28	18	27	21	...	16	11	2	26	27	35.77
Morris County.																					
Morristown	......	3	...	......	......	......	11	11	1	6	14	14	6	14	...	5	7	......	8	19	17.60
Passaic County.																					
Passaic	......	6	...	1	1	.....	6	16	.....	22	21	8	5	8	1	9	2	......	12	16	20.13
Paterson	12	34	...	66	43	10	82	185	8	155	127	59	75	64	6	61	24	2	121	108	30.43
Salem County.																					
Salem	2	1	1	2	....	......	....	12	2	5	2	4	2	5	...	7	2	1	6	10	23.06
Union County.																					
Elizabeth	11	13	...	22	....	......	42	76	6	47	57	42	25	61	1	30	13	1	31	35	27.92
Plainfield	1	4	...	2	.....	......	11	15	......	6	10	9	9	18	...	5	......	......	8	10	25.00
Rahway	1	4	...	3	....	.....	2	11	.....	11	9	11	4	10	1	3	1	1	6	8	19.82
Warren County.																					
Phillipsburg	......	4	...	1	......	......	7	16	1	8	14	7	6	12	1	5	3	......	6	12	22.31
Total	121	431	4	269	152	72	725	1712	131	1416	1,110	746	558	806	37	609	288	28	1009	967	26.62

Total of consumption for all cities as compared with total deaths, 14.66.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

ATLANTIC COUNTY. Population, 18,704. Statistical Divisions.	Deaths at all ages. Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	Principal causes of death. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute Rheumatism.	Consumption—male.	Consumption—female.
Absecon	4	1		1		6	567										3			2									1
*Atlantic City	54	17	26	50	26	178	5,477	32.50*			5		7		1	4	24		10	16	15	12	12		6	5		16	7
Buena Vista	2	1	2	2	3	10	885						1		1		2		1		1				1				
Egg Harbor City	11	4	2	5	7	22	1,232						3				6	1	2			4	1		1	1		3	3
Egg Harbor Township	13	6	1	14	14	48	3,568				1		1				6	1	3	6	1	1	3		5			3	6
Galloway	3	1	4	8	11	27	2,337									2			2	1	3		1		1	1		6	4
Hamilton	6	9	1	4	7	27	1,464						1				6		4	1			1		3			3	1
Hammonton	26	2	1	10	8	47	1,776				1					2	3	1	3	4	1	1	1		1	1		2	3
Mullica			2	1	2	5	717						1								1	1	1						
Weymouth	4		1		2	7	741										1	1					2						
Totals	128	41	40	96	80	347	18,704	19.69			7		14		2	8	52	4	25	31	20	19	22		17	11		33	37

* This and all other cities that are health resorts have an excessive death-rate by reason of temporary increase of population, which also includes a proportion of invalids above the average. Local Boards show this on their records.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

BERGEN COUNTY. Population, 36,766. Statistical Divisions.	Deaths at all ages.									Principal causes of death.																			
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Englewood	10	8	5	20	15	61	4,076	......	......	4	1	......	3	......	......	1	5	1	6	3	6	1	6	......	5	1	......	4	7
Franklin	5	8	3	10	10	36	2,206	......	......	3	......	......	......	1	1	3	2	1	2	3	2	1	3	......	3	......	......	3	2
Harrington	6	......	4	10	13	33	2,570	......	......	......	1	......	......	......	......	......	3	......	......	......	1	4	6	1	5	1	......	1	2
Hohokus	4	1	1	8	10	24	2,920	......	......	1	......	......	......	......	......	1	......	......	3	1	2	......	1	......	2	2	......	2	4
Lodi	17	10	4	15	22	71	4,071	......	......	......	6	......	......	......	......	2	11	1	11	6	5	......	7	......	6	1	......	8	9
Midland	5	1	7	11	6	30	1,591	......	......	2	3	......	......	......	......	8	1	......	6	1	1	2	1	......	2	......	......	3	2
New Barbadoes	15	8	6	26	13	68	4,248	......	......	1	3	......	1	......	1	3	6	3	10	4	3	4	5	2	1	2	......	3	4
Palisade	2	2	1	6	8	19	2,302	......	......	1	3	......	......	......	......	1	2	......	......	1	3	2	2	......	......	......	......	2	1
Ridgefield	22	4	6	20	13	65	3,952	......	......	3	......	......	1	......	......	1	9	5	8	6	2	2	2	......	5	......	......	2	4
Ridgewood	4	2	1	8	5	22	1,478	......	......	1	......	......	......	......	......	......	3	......	2	2	2	......	......	......	1	2	......	1	4
Saddle River	4	2	2	6	10	34	2,355	......	......	3	......	......	......	......	......	......	1	......	3	3	......	1	5	......	2	1	......	2	......
Union	12	5	5	17	9	48	3,164	......	......	1	......	......	1	......	1	2	4	......	4	3	1	3	5	......	4	......	......	3	3
Washin[redacted]n	4	3	1	11	15	34	2,853	......	......	1	2	......	......	......	......	1	8	......	5	1	1	3	4	1	4	......	......	2	1
Totals	110	51	46	171	152	535	36,746	14.54	......	19	18	......	6	1	3	18	50	9	60	33	31	23	47	4	36	10	......	31	39

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending June 30th, 1884.

BURLINGTON COUNTY. POPULATION, 55,403. Statistical Divisions.	DEATHS AT ALL AGES.						Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH.																			
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.				Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Bass River	4			5	2	11	1,006										1	1	1				1					1	2
Beverly	10	4	7	16	12	49	5,128				1		3			2	8	1	1	7	5	1	3		1	1	1	2	4
Bordentown	15	10	13	36	30	105	5,334	19.68			4		12			8	7	8	10	2	9	1	17		11	1		3	7
Burlington	39	11	7	42	37	137	7,237	18.93		1	3		1			7	19		7	5	12	13	14		7	2		10	9
Chester	6	1		11	12	30	3,855				1						4		5	5	4	1	3		3	1		5	3
Chesterfield	1	2	1	8	3	15	1,625						2				1		2		2				1			3	3
Cinnaminson	5	1	1	9	4	23	2,184				2						4	1	4		3				1	2		3	1
Delran	4	2	3	6	8	23	1,760								1	1	2		1	2	1	1	4		2	1		1	1
Eastampton	2	1	4	2	1	10	1,602									3			2				1					3	1
Evesham	3	1	3	5	6	18	566			1			1			1	2		2	1	2	2	1			1		1	1
Florence	4	1	1	8	1	15	1,528			1						1	2	1	1	1	1	1	1					1	1
Little Egg Harbor	3		4	4	6	17	1,881										1			1		2	4		1			1	2
Lumberton	2			1	2	5	1,659										2		1			1			1				
Mansfield	6	1	1	4	8	20	1,648									1	3		1		1	2	2		1			1	2
Medford	5	1		5	17	28	1,960			2	2						3	1	2		3	3	6	1		1			
Mt. Laurel	9	4	1	4	9	27	1,739				1					2	6		1	2	2	2	1		2	1		1	1
New Hanover	8	4	4	6	9	31	2,373			1			2			2	2	1	3	2	1		8		4	1	2	1	3
Northampton	14	7	11	40	40	113	4,630			1	5	1	2		1	7	9	1	4	5	10	3	5	2	4	3		4	20
Pemberton	7	4	5	8	19	43	2,885			1	3					1	5		7		1	3	4		5	1			4
Randolph		3	1	1	2	7	428						3												1	1		1	
Shamong	2		2	1	4	9	1,097									1	1		1		1	1	1		1				1
Southampton	2		3	4	12	21	2,269				1		1				1		1		2	1	5		3			2	1
Springfield	9		3	1	10	23	1,886				1			1			3		4		4		1			1	1		
Washington	1			2	5	8	369				1										1		1		1			1	2
Westampton	3		1	2		6	715										2			1	2				1				
Willingboro	1		1	5	3	9	745					1					1		1		2	1	1		2				
Woodland		1		1		2	325										1												1
Totals	169	69	73	237	261	809	55,403	14.60		5	20	2	27	1	2	32	90	10	62	34	69	39	79	3	51	18	4	45	70

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

CAMDEN COUNTY. POPULATION, 62,942. Statistical Divisions.	DEATHS AT ALL AGES.						Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH.																			
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.				Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism	Consumption—male.	Consumption—female.
* Camden	264	121	78	290	162	932	41,659	22.37	....	7	34	3	28	3	10	44	101	11	74	66	50	23	51	4	47	17	1	65	79
Center	11	6	3	7	9	41	1,832	....	....	1	3	......	......	......	......	......	8	......	4	3	5	1	1	......	3	......	......	2	2
Delaware	2	......	1	8	5	16	1,481	....	....	......	......	......	......	......	......	......	......	1	5	......	1	......	2	......	......	......	......	1	1
Gloucester City	32	14	13	46	8	116	5,347	21.69	....	2	6	......	10	...	5	3	8	2	8	5	4	4	5	......	4	1	......	7	13
Gloucester	17	2	2	27	17	66	2,527	....	....	2	1	......	2	...	......	1	5	......	4	3	7	2	7	1	5	1	......	3	7
Haddon	5	2	3	10	13	33	2,551	....	....	......	2	......	3	......	......	......	3	......	4	......	3	3	6	......	3	......	......	......	2
Stockton	8	8	1	14	6	37	3,532	....	....	......	3	......	1	......	1	4	2	......	5	3	1	......	4	......	1	......	......	3	5
Waterford	3	5	......	10	7	25	2,149	....	....	......	1	......	1	......	......	1	2	......	5	......	1	3	3	......	......	......	......	3	8
Winslow	7	4	1	8	5	25	2,158	....	....	......	......	......	......	......	......	......	2	......	2	2	2	......	......	......	1	......	1	6	3
Totals	349	162	104	420	232	1,291	62,942	20.51	....	12	50	3	45	3	16	53	134	14	111	82	76	38	79	5	64	19	2	90	115

* Cities are generally more unhealthy than their death-rates indicate, since the population is in many of them much decreased for four months in the year, and thousands remove themselves instead of removing the evils which distress and sicken those who remain. Hence, in many of our cities, the death-rate for June, July, August and September, reckoned for the remaining population, would be a fair criterion of the health of locality, or at least should be considered for purposes of correction. So health laws are a great defense to all, but especially to the working classes of cities. See page 330.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

CAPE MAY COUNTY. Population, 9,765. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Cape May City	8	2	3	8	10	31	1,599									2	6		3	2	3		5		1	1		1	1
Dennis	3	2	2	6	1	14	1,813						3				1		1	1			1		1				3
Lower	10	3	3	7	9	33	1,977				1		1			1	4		4	2	1	1	5		1			3	1
Middle	7	3	2	4	19	35	2,675						1				3	3	5	2	6		3		4	3		2	1
Upper	4	3		11	13	31	1,702										2		1		3	1	3		5	2		5	4
Totals	32	13	10	36	52	144	9,766	14.75			1		5			3	16	3	14	7	13	2	17		12	6		11	10

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

CUMBERLAND COUNTY. Population, 37,687. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Bridgeton	33	26	11	48	44	163	8,722	18.69	......	......	4	......	4	......	1	5	23	1	20	10	11	8	5	1	12	2	......	14	15
Commercial	11	4	3	10	3	33	2,265	......	......	......	1	......	......	1	......	......	6	3	......	4	1	1	......	......	3	......	......	2	3
Deerfield	3	......	1	6	6	15	1,513	......	......	......	......	......	......	......	......	......	3	......	......	......	1	......	3	1	3	1	......	......	1
Downe	8	6	1	6	5	24	1,667	......	......	......	......	......	1	......	......	......	3	......	1	3	1	......	3	......	2	......	......	3	3
Fairfield	8	2	2	7	16	35	3,215	......	......	......	2	......	......	......	......	2	4	......	5	......	3	1	4	......	2	3	......	1	1
Greenwich	4	2	1	5	6	18	1,245	......	......	......	......	......	......	......	......	......	1	1	1	1	1	1	4	1	1	......	......	......	1
Hopewell	3	3	2	8	15	30	1,764	......	......	......	......	......	......	......	......	......	2	......	2	4	2	2	6	......	3	2	......	1	1
Landis	25	13	10	33	36	117	6,105	......	......	......	6	......	......	......	1	4	10	1	11	16	6	2	16	......	10	2	......	6	6
Maurice River	7	1	1	6	7	22	2,374	......	......	1	......	......	1	......	......	......	......	......	2	1	4	2	1	......	1	......	......	1	2
Millville	38	8	13	46	38	142	7,660	18.54	......	1	4	......	2	......	......	2	13	4	15	8	5	3	9	......	10	3	......	12	14
Stoe Creek	1	1	1	3	4	10	1,107	......	......	......	......	......	......	......	......	......	1	......	......	......	1	......	3	......	......	......	......	1	1
Totals	141	66	46	178	178	609	37,687	16.16	......	2	17	......	6	1	2	13	64	10	57	49	35	20	55	3	47	13	......	41	57

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

ESSEX COUNTY. Population, 189,929. Statistical Divisions.	Deaths at all ages. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	Principal causes of death. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Belleville	5	1	6	18	10	43	3,004	....	....	2	1	......	3	......	......	......	3	......	4	3	5	3	8	1	5	1	1	4	3
Bloomfield	15	15	5	23	21	85	5,748	....	....	......	2	......	1	1	1	6	8	......	7	6	1	3	7	1	4	3	......	6	4
Caldwell	5	3	5	18	12	43	3,167	....	....	1	1	......	1	......	1	1	2	......	2	5	5	1	5	......	1	1	......	5	7
Clinton	11	5	4	8	8	36	2,742	....	....	......	3	......	......	1	......	3	4	......	4	3	......	1	5	......	2	......	......	3	1
East Orange	15	6	11	40	33	105	5,249	....	....	1	6	......	2	......	......	1	10	2	10	4	5	5	13	......	2	7	1	12	7
Franklin	4	3	......	10	9	27	1,617	....	....	......	1	......	......	1	......	2	1	......	4	1	2	......	2	......	6	1	......	1	2
Livingston	......	2	......	5	2	9	1,401	....	....	......	1	......	......	......	......	......	1	......	1	......	1	1	1	......	......	......	......	......	3
Millburn	5	3	......	4	7	19	1,743	....	....	......	......	......	......	......	......	2	2	1	4	2	1	1	2	......	......	1	......	......	1
Montclair	19	13	7	23	16	82	5,147	....	....	1	1	......	......	......	1	10	7	......	7	8	7	1	9	1	4	1	......	6	7
Newark	836	503	295	1147	560	3,372	136,508	24.70	....	28	87	......	79	46	6	176	402	29	407	294	182	162	315	6	140	82	1	276	210
Orange	81	44	35	105	36	291	13,207	22.05	....	1	6	......	12	1	1	15	35	4	81	26	12	11	8	3	15	5	......	31	33
South Orange	5	6	7	20	12	51	3,911	....	....	......	1	......	......	......	......	7	3	2	4	4	6	2	1	1	1	......	......	5	9
West Orange	14	6	5	13	11	51	3,365	....	....	......	1	......	......	1	......	3	9	......	1	4	3	......	5	......	3	1	1	4	2
Totals	1090	614	368	1433	761	4,211	189,929	22.17	....	34	118	......	99	53	10	226	488	29	456	347	253	194	274	13	153	103	4	353	279

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

GLOUCESTER COUNTY. Population, 25,886. Statistical Divisions.	Deaths at all ages. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	Principal causes of death. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Clayton	7	3	2	10	6	28	1,931	......	......	......	......	......	1	......	......	......	1	3	1	3	1	......	1	......	1	......	......	6	3
Deptford	3	4	2	9	6	24	1,520	......	......	1	1	......	1	......	......	......	3	......	6	2	2	......	2	......	1	......	......	......	1
East Greenwich	2	......	2	4	7	15	......	......	......	......	......	......	2	......	......	1	1	......	1	......	1	2	1	......	3	......	......	......	1
Franklin	5	7	2	9	9	33	2,480	......	......	3	......	......	1	1	1	1	2	......	3	1	......	3	1	......	2	1	......	4	3
Glassboro	9	4	2	11	17	43	2,066	......	......	......	......	......	......	......	......	3	2	......	6	5	......	1	4	......	6	......	......	4	3
Greenwich	2	1	1	11	7	25	2,598	......	......	......	1	......	......	......	......	......	1	......	1	......	3	3	2	1	......	1	......	1	3
Harrison	3	2	4	6	4	19	2,311	......	......	......	2	......	......	......	......	......	1	......	3	1	2	......	3	......	3	......	......	......	1
Logan	5	3	5	7	7	27	1,765	......	......	......	......	......	6	......	......	......	1	1	2	......	2	......	4	......	3	1	......	......	2
Mantua	10	7	1	8	5	32	1,718	......	......	......	1	......	2	......	1	......	6	......	......	6	......	......	5	......	2	......	......	4	2
Monroe	5	3	3	10	8	29	1,838	......	......	......	1	......	......	......	......	......	4	......	2	4	3	3	......	1	3	2	......	3	3
South Harrison	5	1	......	4	4	12	......	......	......	......	......	......	......	......	......	2	......	......	1	......	......	......	......	......	3	......	......	1	3
Washington	5	2	1	5	11	21	1,366	......	......	......	......	......	......	......	......	1	3	......	1	1	......	......	2	......	2	......	......	4	4
West Deptford	5	2	6	8	5	29	1,399	......	......	......	......	......	5	......	......	......	2	......	2	1	3	2	1	......	2	1	......	1	5
Woodbury	7	2	4	21	13	47	2,208	......	......	......	2	......	1	......	......	......	3	......	1	......	3	3	5	......	5	......	......	4	7
Woolwich	5	9	4	10	12	40	1,974	......	......	......	2	......	3	......	1	1	4	......	5	3	6	......	5	......	1	3	......	3	3
Totals	76	50	38	133	122	427	25,886	16.49	......	4	10	......	19	1	3	6	34	4	33	26	24	16	36	2	35	8	......	33	37

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

HUDSON COUNTY. POPULATION, 157,944. Statistical Divisions.	DEATHS AT ALL AGES.						Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH.																			
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.				Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Bayonne	55	32	19	80	22	208	9,372	22.19	....	1	15	......	1	......	......	12	32	3	10	18	11	7	11	1	6	1	1	13	15
Guttenberg	13	4	3	12	1	33	1,206	....	....	......	......	......	......	......	......	4	6	......	2	3	2	......	......	1	2	......	......	1	5
Harrison	39	17	13	66	17	152	6,898	22.03	....	5	9	......	8	1	......	9	15	1	19	21	7	2	7	......	5	4	1	14	11
Hoboken	288	84	62	233	46	706	30,999	22.13	....	3	24	......	12	5	1	23	95	12	65	78	46	25	29	2	37	10	7	44	59
Jersey City	791	473	277	1081	404	3,026	120,722	25.15	....	37	116	......	65	45	20	132	425	25	384	240	163	106	157	6	137	61	7	209	209
Kearny	10	4	5	10	6	35	777	....	....	......	......	......	......	1	......	3	3	......	3	2	3	......	1	......	......	4	......	2	1
North Bergen	47	19	6	91	55	218	4,265	....	....	5	1	......	8	......	......	1	17	2	12	12	10	16	20	......	9	3	......	26	17
Town of Union	43	22	6	46	20	137	5,849	23.42	....	3	8	......	1	......	2	6	32	2	11	8	10	3	9	1	4	3	2	14	8
Union	4	9	4	8	3	28	1,310	....	....	3	1	......	......	......	......	8	2	......	3	3	1	3	......	......	1	......	......	3	3
Weehawken	6	3	5	6	6	25	1,102	....	....	......	1	......	......	......	......	4	3	......	4	1	1	2	1	1	......	1	......	......	1
West Hoboken	38	19	13	30	11	111	5,441	....	....	1	5	......	5	2	1	10	19	1	8	13	9	3	2	......	6	1	......	5	7
Totals	1357	686	413	1711	613	4,669	157,944	24.93	....	56	189	......	80	54	24	198	649	46	527	399	253	165	247	12	207	88	18	333	336

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

HUNTERDON COUNTY. Population, 38,570. Statistical Divisions.	Deaths at all ages. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	Principal causes of death. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Alexandria	....	3	4	3	7	17	1,324	....	....	....	1	....	2	....	....	1	1	....	1	....	2	2	4	....	....	....	....	....	1
Bethlehem	3	1	5	14	12	35	2,830	....	....	....	....	....	....	....	....	....	1	1	6	1	5	2	4	....	3	3	....	2	3
Clinton borough	2	1	3	4	6	16	842	....	....	1	....	....	....	....	....	....	2	....	2	2	1	1	1	....	....	....	....	2	3
Clinton township	4	1	....	4	10	19	2,133	....	....	....	....	....	....	....	....	1	....	....	2	....	3	2	5	....	....	....	....	2	1
Delaware	11	2	2	12	16	43	3,092	....	....	....	....	....	....	....	....	3	3	....	3	2	5	1	4	....	2	1	....	4	5
East Amwell	2	4	....	6	8	20	1,696	....	....	....	....	....	1	....	....	2	....	....	3	1	3	....	4	....	2	....	....	....	....
Franklin	....	1	....	5	5	12	1,334	....	....	....	....	....	....	....	....	....	....	....	2	....	2	2	2	....	....	....	....	2	2
Frenchtown	2	2	....	3	6	14	1,039	....	....	....	....	....	....	....	....	1	1	1	....	2	1	2	2	....	1	1	....	2	....
High Bridge	5	....	1	10	7	23	2,309	....	....	....	....	....	....	....	....	....	1	1	....	2	2	....	4	....	1	....	....	1	5
Holland	3	1	4	1	10	19	1,886	....	....	2	....	....	....	....	....	3	....	....	*5	1	4	1	1	....	1	....	....	2	....
Kingwood	....	....	1	5	9	15	1,691	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	5	....	....	....	....	....	5
Lambertville	8	1	7	9	14	39	4,153	....	....	1	....	1	2	2	....	1	5	....	2	1	....	2	9	....	3	....	....	1	4
Lebanon	7	5	1	12	8	33	2,699	....	....	....	....	....	....	....	1	....	4	....	10	....	2	....	2	1	6	1	....	2	2
Raritan	4	4	4	15	23	50	4,188	....	....	....	1	....	2	....	....	....	2	2	5	1	3	3	9	2	1	2	....	6	2
Readington	5	3	1	10	15	35	3,103	....	....	....	....	....	....	....	....	1	1	....	2	2	2	1	7	....	4	1	....	....	5
Tewksbury	5	2	5	8	5	26	2,108	....	....	....	....	....	3	....	....	....	....	1	4	....	3	4	2	1	2	2	....	....	1
Union	1	1	1	1	2	6	1,168	....	....	....	....	....	....	....	....	....	1	....	1	....	....	....	....	....	....	....	....	....	....
West Amwell	2	....	....	3	2	7	1,039	....	....	....	....	....	....	....	....	....	....	1	1	....	1	....	....	....	....	1	....	....	....
Totals	66	32	39	125	165	429	38,570	11.12	....	4	2	1	*10	2	1	13	22	7	49	15	38	23	65	4	26	12	....	26	43

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

MERCER COUNTY. Population, 58,061. Statistical Divisions.	Deaths at all ages: Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.
Chambersburg	36	27	5	37	14	134	5,437	22.81	......
East Windsor	5	......	......	7	7	22	2,271	......	......
*Ewing	7	2	6	34	23	72	2,412	......	......
Hamilton	11	1	5	15	22	57	3,370	......	......
Hopewell	4	6	5	18	20	54	4,462	......	......
Lawrence	......	5	5	5	9	22	3,174	......	......
Millham	10	7	9	5	4	35	......	......	......
Princeton	9	10	10	16	26	72	4,348	......	......
Trenton	131	119	66	192	107	633	29,910	21.13	......
Washington	2	1	......	3	8	14	1,281	......	......
West Windsor	1	......	2	6	8	17	1,396	......	......
Totals	217	174	114	340	273	1,124	58,061	19.36	......

Statistical Divisions.	Principal causes of death: Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Chambersburg	2	......	......	7	1	1	7	26	3	5	6	9	2	9	......	3	7	......	7	13
East Windsor	......	......	......	......	......	......	......	......	......	3	2	2	1	5	1	1	2	......	1	......
*Ewing	......	......	......	......	......	......	2	3	......	5	3	1	......	35	......	4	2	1	7	6
Hamilton	1	......	......	......	......	......	3	4	......	7	2	6	......	5	......	1	1	......	5	5
Hopewell	......	......	......	2	1	......	......	2	......	1	1	5	3	10	......	2	5	3	6	6
Lawrence	......	......	......	2	......	......	2	1	......	......	2	3	1	4	......	2	1	1	1	......
Millham	1	1	......	2	......	1	12	4	......	1	3	......	2	5	......	......	......	......	2	......
Princeton	......	1	......	2	......	......	3	9	1	8	4	10	4	9	2	3	1	......	1	7
Trenton	3	21	......	33	2	14	61	62	9	44	31	32	15	52	3	24	15	1	51	43
Washington	......	......	......	......	......	......	......	1	......	2	*1	3	......	1	1	......	......	1	2	1
West Windsor	2	2	......	......	......	......	......	1	......	......	......	4	......	3	......	......	......	......	......	4
Totals	9	25	......	49	4	16	90	113	13	76	56	75	31	136	7	46	37	7	53	88

* Ewing township includes Asylum. See Adult Brain column.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

MIDDLESEX COUNTY. Population, 52,266. Statistical Divisions.	Deaths at all ages. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	Principal causes of death. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Cranbury	......	2	2	4	8	17	1,499	......	......	......	......	......	......	......	......	1	......	......	3	1	......	2	1	......	5	......	......	1	2
East Brunswick	5	9	10	13	16	59	3,277	......	......	1	1	......	3	......	......	10	2	1	1	3	5	3	4	......	4	1	......	4	4
Madison	5	1	1	3	1	11	1,762	......	......	......	......	......	......	......	1	1	1	......	......	1	1	1	......	......	1	......	......	......	4
Monroe	1	4	1	3	4	13	3,017	......	......	......	......	......	......	......	......	......	4	......	......	1	......	1	2	......	......	1	1	1	......
New Brunswick	81	65	69	109	68	397	17,166	23.13	......	2	14	......	7	3	......	66	51	4	37	36	18	37	21	......	16	11	2	26	37
North Brunswick	3	2	5	7	7	24	1,351	......	......	......	......	......	1	......	......	3	1	......	2	1	1	2	5	......	1	2	......	3	2
Perth Amboy	43	33	19	42	10	150	4,808	......	......	2	9	......	17	1	......	11	14	3	5	30	3	6	6	......	5	3	......	6	9
Piscataway	4	5	6	22	11	48	3,243	......	......	......	2	......	1	......	......	2	2	......	6	1	3	3	1	......	4	2	......	3	5
Raritan	4	5	5	17	16	47	3,789	......	......	......	2	......	1	......	......	5	6	......	4	1	7	3	4	......	4	1	......	3	4
Sayreville	7	5	1	10	......	23	1,930	......	......	......	1	......	......	4	......	......	3	......	1	2	2	......	1	......	......	......	......	3	2
South Amboy	16	14	6	25	15	76	3,645	......	......	2	2	......	1	......	......	9	7	1	4	2	4	2	11	......	5	......	......	5	6
South Brunswick	4	4	3	16	14	41	2,903	......	......	......	1	......	1	......	......	1	2	......	......	3	1	4	6	......	3	2	......	4	5
Woodbridge	14	13	10	18	14	72	4,099	......	......	1	2	......	3	3	......	2	15	1	13	3	2	3	4	......	4	2	......	3	5
Totals	190	167	138	288	186	978	53,286	18.70	......	6	34	......	35	10	1	109	110	10	86	67	47	60	66	......	52	34	3	63	75

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

MONMOUTH COUNTY. POPULATION, 55,538. Statistical Divisions.	DEATHS AT ALL AGES.						Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH.																			
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.				Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Atlantic	1	4	...	5	8	16	1,745	...	...	1	1	...	...	...	2	...	1	...	2	2	1	1	...	...	1	...	...	1	1
Eatontown	7	2	3	12	12	36	2,642	...	...	...	2	...	2	...	...	...	4	...	5	1	1	1	5	...	3	1	...	3	5
Freehold	12	6	5	29	18	70	4,302	...	...	2	1	...	...	...	...	3	6	...	6	3	10	5	9	...	2	1	2	6	5
Holmdel	4	1	1	1	7	14	1,575	...	...	1	...	...	...	...	...	...	1	...	...	1	2	2	...	...	1	...	...	...	2
Howell	1	6	...	15	12	35	2,374	...	...	4	...	...	...	...	...	...	...	1	4	1	6	2	5	...	1	1	...	2	2
Manalapan	2	1	2	6	6	17	2,175	...	...	...	...	...	...	...	...	...	1	...	1	8	2	...	...	...	1	2	...	3	3
Marlboro	3	2	5	5	6	21	2,193	...	...	...	...	...	...	2	...	...	1	...	2	1	1	...	...	...	1	...	...	1	1
Matawan	13	4	6	18	12	53	2,699	...	...	...	1	...	...	...	...	1	5	3	7	5	2	2	6	...	1	...	...	6	5
Middletown	25	6	3	22	17	74	5,059	...	...	3	1	...	...	...	...	...	6	...	10	4	11	1	6	...	4	2	...	2	6
Millstone	4	3	1	4	13	25	2,080	...	...	...	...	...	1	...	...	...	2	...	3	1	4	2	1	...	4	...	...	1	1
Neptune	35	11	8	44	37	135	4,187	...	...	3	7	...	...	...	...	6	18	2	12	9	12	4	13	...	3	5	...	4	4
Ocean	29	10	3	24	22	92	6,027	...	...	1	...	...	...	...	1	1	16	...	10	7	12	5	6	2	1	1	1	4	7
Raritan	17	8	3	22	13	63	3,891	...	...	5	2	...	2	1	1	2	7	...	6	7	5	...	2	...	6	...	1	7	4
Shrewsbury	23	11	15	24	36	110	6,526	...	...	...	3	...	2	...	...	2	7	...	16	7	11	5	8	1	2	2	...	9	15
Upper Freehold	11	1	4	9	21	46	3,236	...	...	...	...	...	1	...	1	...	6	...	8	1	2	4	5	...	2	...	1	2	
Wall	15	10	4	10	20	59	3,829	...	...	...	2	...	...	...	...	5	12	...	3	6	4	8	5	...	4	...	...	2	...
Totals	202	55	63	260	240	856	55,538	15.45	...	16	19	...	9	3	6	20	93	7	90	69	88	40	71	3	35	15	5	54	66

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

MORRIS COUNTY. Population, 50,861. Statistical Divisions.	Deaths at all ages: Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	Principal causes of death: Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Boonton	11	9	2	16	12	50	2,462	....	....	1	2	.....	....	2	1	1	6	.....	3	2	5	1	3	.....	6	1	1	4	3
Chatham	6	10	6	22	20	64	4,276	....	....	.....	2	.....	1	1	1	5	6	.....	3	2	7	5	6	.....	4	3	.....	2	9
Chester	3	4	2	2	10	21	2,337	....	....	.....	.....	.....	.....	.....	.....	4	1	.....	4	1	1	1	4	.....	2	1	.....	.....	.....
* Hanover	5	1	6	48	43	103	4,138	....	....	1	1	.....	.....	.....	.....	2	2	1	5	1	6	4	57	.....	4	2	2	3	2
Jefferson	5	1	3	5	5	19	1,792	....	....	.....	.....	.....	.....	.....	.....	.....	1	1	6	3	.....	1	2	.....	.....	.....	.....	1	2
Mendham	4	4	1	8	10	23	1,526	....	....	.....	1	.....	1	.....	.....	.....	1	.....	1	.....	2	.....	3	.....	4	1	.....	2	1
Montville	3	1	1	4	4	14	1,270	....	....	2	.....	.....	.....	1	.....	.....	2	1	4	.....	.....	1	.....	.....	.....	.....	.....	1	1
Morristown	27	17	9	44	42	142	6,837	20.77	....	.....	3	.....	.....	.....	.....	11	11	1	6	14	18	5	14	.....	5	7	.....	8	19
Mt. Olive	5	3	1	7	5	21	1,982	....	....	.....	2	.....	.....	.....	.....	1	2	.....	2	.....	2	1	1	1	1	1	.....	1	.....
Passaic	5	4	1	4	9	23	1,896	....	....	.....	1	.....	.....	.....	.....	.....	.....	.....	8	3	1	3	3	.....	1	.....	.....	.....	.....
Pequannock	9	5	4	7	7	32	2,239	....	....	1	1	.....	.....	.....	2	.....	5	1	2	4	2	2	.....	1	3	.....	.....	2	4
Randolph	24	9	13	28	20	94	7,700	....	....	4	1	.....	1	.....	.....	5	9	.....	12	10	5	1	11	.....	6	2	.....	6	5
Rockaway	22	17	5	24	19	87	7,366	....	....	1	3	.....	1	.....	6	.....	11	.....	20	1	2	4	6	2	2	3	.....	6	4
Roxbury	5	2	2	7	8	24	2,139	....	....	.....	.....	.....	.....	.....	.....	.....	.....	1	3	2	3	.....	1	.....	2	.....	.....	2	2
Washington	8	.....	4	11	8	31	2,681	....	....	.....	1	.....	3	.....	1	.....	.....	1	1	4	3	1	4	1	.....	.....	.....	2	5
Totals	142	87	60	237	222	748	50,861	14.71	....	10	18	.....	7	4	11	29	57	7	50	47	57	30	115	5	40	21	3	40	57

* Hanover township includes Asylum. See Adult Brain column.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

OCEAN COUNTY. Population, 14,455. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal disease.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Berkeley	2			3	3	8	583				1					1			1			1			2	1			
Brick	9	6	3	21	14	53	2,990				3						6		10	2	1	2	5	3	4	3		3	6
Dover	7	1	3	10	16	37	2,430			1			1	1	2				3	3	2		7	1	4	1			5
Eagleswood	2			2	4	8	592				1									1			1			1			2
Jackson	4	5	4		8	22	1,803						1				2		3	2	2	1	1		1		2	1	2
Lacey	4	1		6	3	14	814						1				1		3	1					4	1			
Manchester	5	1	1	4	3	14	1,057				2						1		1	1			1			2			2
Ocean	1	2	1	3	4	11	484				1					1	1		2		2		1						1
Plumstead	9	2	1	8	5	25	1,561			1					1		2	1	3	2	1	2	3		1			1	3
Stafford		2	2	9	6	19	1,066				1					2				1	1		1		2	1		1	1
Union	1		1	3	4	9	1,024										1		1		1	1	1						4
Totals	44	22	16	69	71	220	14,455	15.63		2	9		3	1	3	4	16	1	25	14	10	7	21	3	18	10	2	6	36

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

PASSAIC COUNTY. Population, 68,860. Statistical Divisions.	Deaths at all ages.						Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	Principal causes of death.																				
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.				Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrhoeal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Acquackanonk	3	......	4	3	6	25	1,781	....	....	1	2	......	......	......	......	......	3	......	4	1	1	1	5	......	2	......	......	......	3
Little Falls	6	2	2	5	3	18	1,404	....	....	......	......	......	......	......	1	......	3	......	1	1	1	1	1	......	3	1	......	......	1
Manchester	2	2	1	3	4	12	1,513	....	....	......	......	......	......	1	......	......	1	......	2	1	2	......	1	......	1	......	......	1	1
Passaic	41	12	16	56	27	154	6,532	23.58	....	......	6	......	1	1	......	6	16	......	27	21	8	6	8	1	9	2	......	12	16
Paterson	363	230	141	403	250	1,446	51,031	28.33	....	12	34	......	68	43	10	83	185	8	155	127	59	73	64	6	61	24	2	131	109
Pompton	......	1	6	11	6	32	2,251	....	....	2	......	......	1	1	......	......	3	......	6	5	5	......	3	......	2	......	......	1	2
Wayne	9	......	......	4	3	7	1,757	....	....	......	2	......	......	......	......	......	......	......	2	......	......	......	1	......	......	......	......	2	2
West Milford	6	4	2	7	6	25	2,591	....	....	......	......	......	......	......	......	2	1	......	1	1	3	1	2	......	......	1	......	2	4
Totals	630	301	171	502	304	1,719	68,860	21.96	....	15	41	......	70	46	11	90	212	8	195	157	76	85	85	7	77	28	2	139	139

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

SALEM COUNTY. Population, 24,579. Statistical Divisions.	DEATHS AT ALL AGES. Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute Rheumatism.	Consumption—male.	Consumption—female.
Alloway	6	2	2	5	12	26	1,917				2					3	1		4		2	2	4		1	1		1	2
Elsinboro	3	3	1	1	3	11	578							1	2		2		1				2						
Lower Alloways Creek	5		3	8	7	23	1,373			2						2	3		1		1	2	1		3	1		1	4
Lower Penn's Neck	3		1	6	6	16	1,334				1			1		1	2				1	1	2		1	1		3	
Mannington	7	4	3	14	8	37	2,230			2	1				1		5		2		2	3	2		2	1		2	3
Oldmans	4	1		6	6	17					1		1				2			2	2		2		1				3
Pilesgrove	12	5	10	13	20	60	3,497				5					2	10	1	5	4	1		9		4	1		7	6
Pittsgrove	5	3	4	7	6	25	1,778				2					3	5		2			3	3		1			3	3
Quinton	6	4	1	5	5	23	1,390							1			6		2	1			1					3	3
Salem	23	5	16	24	10	78	5,056	15.43		2	1	1	2				12	2	5	2	4	2	5		7	2	1	6	10
Upper Penn's Neck	13	6		4	10	36	2,361				1					4	8		1	3	2		3		1			3	2
Upper Pittsgrove	3		3	8	8	22	2,073				2		1	1			1			1	1	3	1		1		1	2	2
Totals	90	33	36	101	111	376	24,579	10.30		6	16	1	4	4	5	16	55	3	23	13	17	15	34		22	7	2	32	38

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

SOMERSET COUNTY. POPULATION, 27,162. Statistical Divisions.	DEATHS AT ALL AGES.						Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH.																			
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.				Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Bedminster	3	1	6	9	7	26	1,812						2	1			1	1	2	1	4		2				1	6	2
Bernards	3	6	8	6	9	33	2,622				1		6		1	4	1	1	4	5		9	4			3		6	1
Branchburg	2	1	2	10	3	18	1,316				1					1		1	1	1			2			1		3	1
Bridgewater	20	7	6	46	25	104	7,997			3	2					1	5	3	9	10	9	3	9	1	3	6	1	9	11
Franklin	6	2	3	15	18	47	3,518						2			1	3	1	2	3	1	3	11		3	1		3	6
Hillsborough	4	2	2	11	23	42	3,348			1	2						1		3	1	6	1	9		4	2		6	
Montgomery	3	3		4	18	28	1,925									1	3	1	3			3	2		4	1	1	1	1
North Plainfield	7	4	2	15	7	35	3,217				1					3	1		3	3	7	3	4		3			3	2
Warren	2		1	7	6	16	1,204										3	1	1			2	3		3			1	2
Totals	50	26	29	125	115	346	27,162	12.81		5	7		11	1	1	11	18	9	24	20	27	19	45	1	18	16	8	39	24

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

SUSSEX COUNTY. POPULATION, 23,539. Statistical Divisions.	DEATHS AT ALL AGES.						Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH.																			
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.				Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Andover	1	......	1	6	4	12	1,150	......	......	......	......	......	......	......	......	......	1	......	......	......	1	......	......	1	2	......	......	......	2
Byram	3	3	2	9	4	21	1,406	......	......	1	......	......	......	......	......	2	3	......	2	......	2	1	2	......	1	......	......	......	3
Frankford	5	......	3	3	16	27	1,682	......	......	......	......	......	......	......	......	1	1	......	4	......	3	......	2	......	3	......	......	5	1
Greene	4	......	......	4	1	9	727	......	......	......	1	......	......	......	......	......	1	......	2	1	......	......	......	......	......	......	......	......	......
Hardyston	13	1	1	8	12	35	2,645	......	......	1	......	......	......	......	......	......	3	......	11	2	......	1	2	......	......	......	......	5	3
Hampton	2	......	......	7	8	17	890	......	......	1	......	......	......	......	......	1	1	......	......	......	5	1	5	......	1	1	......	......	......
Lafayette	......	1	1	6	2	10	781	......	......	......	......	......	......	......	......	......	1	......	2	......	......	......	1	......	2	......	......	......	3
Montague	1	......	......	1	......	2	1,022	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	1	......	......
Newton	7	2	2	14	11	36	2,513	......	......	......	1	......	1	......	......	2	3	......	3	3	2	2	2	......	2	3	......	6	6
Sandyston	1	......	2	2	5	11	1,196	......	......	......	......	......	......	......	......	......	1	1	4	......	......	......	1	......	2	......	......	......	2
Sparta	2	4	2	7	4	19	2,274	......	......	......	......	......	......	......	......	1	3	......	2	2	2	......	3	......	......	1	......	1	1
Stillwater	2	2	......	6	5	15	1,502	......	......	1	1	......	......	......	......	1	1	......	......	1	1	1	1	......	3	......	......	2	1
Vernon	3	1	3	8	7	22	1,811	......	......	......	1	......	1	......	1	......	3	......	3	......	1	1	......	1	3	1	......	......	2
Walpack	3	......	......	1	......	5	575	......	......	......	1	......	......	......	......	......	2	......	1	1	......	......	......	......	......	......	......	......	......
Wantage	7	......	6	13	23	50	3,261	......	......	......	2	......	......	......	1	......	3	1	9	1	5	2	6	2	3	1	......	4	7
Totals	54	14	23	95	102	293	23,539	12.44	......	4	7	......	2	......	2	8	26	3	43	11	21	9	27	4	25	7	1	25	31

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

UNION COUNTY. Population, 55,571. Statistical Divisions.	Deaths at all ages. Under one.*	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	Principal causes of death. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
* Clark							353																						
Cranford	3	3	3	6	4	19	1,194						1			1	6	2	2		1		2		4				
Elizabeth	164	85	69	177	96	591	28,229	20.93		11	13		22			42	76	6	47	57	42	20	41	1	20	13	1	31	35
Fanwood	1	1	1	4	4	11	1,167													1			4		1			1	2
Linden	3	3	5	11	6	28	1,569						3			2	4		2		5	3	2		2			2	1
New Providence	3	2	6	3	6	20	761						1			1			3	5	2	1			1			1	1
Plainfield	32	10	16	39	35	132	8,125	16.25		1	4		2			11	16		6	10	9	9	18		5			6	10
Rahway	23	11	13	31	33	111	6,455	17.19		1	4		3			2	11		11	9	11	4	10	1	3	1	1	6	8
Springfield	1	1		1	6	9	844										1			1		3	1			1		2	
Summit	2	4	1	8	9	24	1,910			2	1		1				4	1	1	1	2		1		1	1		3	1
Union	14		4	7	16	41	2,418			1	2					3	6		3		2		4		1			1	3
Westfield	6	4	1	13	11	35	2,216				2						4		3	3	3	1	4		2			3	3
Totals	252	124	119	300	226	1,021	55,571	18.37		16	26		33			63	137	9	78	87	77	43	87	3	40	16	2	56	64

* Clark township too late for tabulation.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending June 30th, 1884.

WARREN COUNTY. POPULATION, 36,589. Statistical Divisions.	DEATHS AT ALL AGES.						Population, census of 1880	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH.																			
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.				Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Allamuchy	1	......	1	3	1	6	646	......	......	1	......	......	......	......	......	......	......	......	1	1	......	......	......	......	......	......	......	1	1
Belvidere	5	1	1	14	11	32	1,773	......	......	......	1	......	......	......	......	1	2	......	7	1	......	2	4	......	2	1	......	5	2
Blairstown	1	1	2	3	6	13	1,456	......	......	......	......	......	......	......	......	......	1	......	......	1	1	1	2	......	2	......	......	2	......
Franklin	......	1	1	4	9	15	1,039	......	......	......	1	......	1	......	......	......	......	......	1	......	1	......	1	......	......	2	......	3	1
Frelinghuysen	1	......	......	3	3	7	1,042	......	......	......	......	......	......	......	......	......	......	1	1	......	1	1	1	......	1	......	......	......	......
Greenwich	2	1	1	4	7	15	2,334	......	......	......	......	......	......	......	......	......	......	1	1	1	3	......	2	......	3	......	......	2	2
Hackettstown	7	6	6	9	8	36	2,502	......	......	1	1	......	2	......	......	1	3	......	4	6	4	2	4	1	......	......	......	1	4
Hardwick	1	......	......	1	4	6	583	......	......	......	......	......	......	......	......	......	......	......	......	......	1	......	1	......	......	......	......	......	3
Harmony	1	4	1	6	5	18	1,350	......	......	......	......	......	......	......	......	......	1	......	2	2	......	2	2	......	......	......	......	1	5
Hope	6	......	1	2	8	17	1,069	......	......	......	......	......	......	......	......	......	2	......	3	1	2	......	3	......	......	......	......	......	7
																									......	......	......	......	2
Independence	......	......	1	3	2	6	1,018	......	......	......	1	......	......	......	......	......	......	......	1	......	......	......	1	......					
Knowlton	5	......	3	6	10	24	1,476	......	......	......	1	......	......	......	......	......	1	......	1	3	......	2	2	......	4	......	......	1	2
Lopatcong	3	1	1	4	5	14	1,391	......	......	......	......	......	......	......	......	1	......	......	2	1	2	1	2	......	1	1	......	1	......
Mansfield	4	......	3	9	11	27	1,709	......	......	......	......	......	......	......	......	......	1	1	1	2	2	1	4	......	1	2	......	5	1
Oxford	14	6	9	14	8	51	4,094	......	......	......	......	......	1	......	......	3	3	1	6	5	5	......	4	......	3	3	3	1	2
																									......	......	1	......	2
Pahaquarry	2	......	2	2	2	8	416	......	......	......	......	......	......	......	......	......	......	......	2	2	......	1	......	......					
Phillipsburg	40	16	10	42	22	130	7,181	15.10	......	......	4	......	1	......	......	7	16	1	6	14	7	6	12	1	5	2	......	6	12
Pohatcong	1	2	2	8	6	20	......	......	......	......	1	......	......	......	......	2	1	......	2	2	1	1	3	......	......	......	......	1	3
Town of Washington	6	5	2	12	4	32	2,143	......	......	......	2	......	......	......	......	3	5	2	1	1	3	1	2	......	2	1	......	1	1
Washington township	1	1	2	4	6	13	1,453	......	......	......	......	......	......	......	......	......	......	......	1	1	1	......	......	......	......	3	......	......	1
Totals	104	44	48	152	157	489	36,589	13.36	......	3	13	......	5	......	......	15	36	7	44	44	34	22	50	2	23	17	4	32	46

SYNOPSIS OF VITAL RETURNS AND COMMENTS ON SPECIAL DISEASES.

The records for the statistical year ending June 30th, 1884, as shown by the tables accompanying this report, give an aggregate of 8,968 marriages, 25,263 births, and 21,716 deaths. For the previous year, from July 1st, 1882, to July 1st, 1883, the record showed 9,166 marriages, 24,430 births, and 23,310 deaths. From July 1st, 1881, to July 1st, 1882, the record was 8,837 marriages, 23,108 births, and 25,959 deaths. These represent years in which the returns have been most complete, and are believed to show a reliable decrease in the death-rate of the State.

For these years the total deaths under five years of age were as follows:

1881–2	10,512
1882–3	8,790
1883–4	7,971
Total	27,273

The following is the aggregate of deaths from zymotic diseases for the last three years in the State, each year being stated separately:

1881–2	7,753
1882–3	5,973
1883–4	5,298
Total	19,024

This gives 38.42, or over one-third of the deaths, as under five years of age, and 26.80, or over one-fourth, from this class of diseases. There is some difference of judgment as to one or two of the diseases to be classed as zymotic. The term means ferment, and was first applied to a class of diseases which were believed to depend upon some form of septic ferment developed under special circumstances. In

these, animal or vegetable decay or putrefaction was believed to give rise to special classes of symptoms, although the accurate chemical conditions which determined whether the disease should be one or the other was not known.

Since some form of vegetative life has come to be recognized as an essential factor in most if not all of these diseases, the former term is not so descriptive. They have been since associated under the names of communicable diseases, or preventable diseases, or filth diseases.

In the present state of our knowledge, it is recognized that the fevers spoken of as remittent or intermittent, typhus, typhoid, and relapsing fever and small-pox, scarlet fever, measles, whooping-cough, croup and diphtheria, erysipelas and diarrhea, as found among our infantile population, are dependent upon local conditions, or upon the conveyance of a contagion. Cholera and yellow fever belong to the same category. Consumption is recognized as largely owing to the local conditions of surroundings or to the diatheses of individuals, and is claimed by some to be communicable. However this may be, it is no doubt to a great degree a preventable disease. Many cases of brain and nervous disease, also, might well be classed as preventable. In the statistical tables as printed we give the causes in the more prominent or specified diseases. Also, for the purpose of showing the proportion of the diseases largely preventable, we associate together the first eight diseases named in the table, and add to it erysipelas, which has come to be regarded as a disease dependent on a specific contagion. In the above enumeration, and in our comparative percentage of so-called zymotic diseases as given in the table, all these are included. Also, typhus fever, which is very rare, but which, when occurring, is distinguished by a dot in the typhoid column of the office record. With the caution that all figures for a single year are approximate indications as to the healthfulness of persons in localities, to be corrected by comparisons with larger numbers over a larger number of years, and by incidental facts which modify their significance, we proceed to note in general some of the more prominent indications and facts as to the prevalence of various diseases. The first notable fact is a variation depending largely upon density of population. This is not only noticeable when we study a county like Hunterdon, with a death-rate of 11.12 per thousand, and compare it with Jersey City and Paterson at 25.15 and 28.33 respectively. Even with this we are to remember that Hunterdon county has a city so large as Lambertville,

which increases its death-rate over that of a county population. Also, that here and there a close street in a small village is also a factor in disease. It would be expected that the crowding of persons and of human habitations would increase the ratio of disease, but such is found to be the case to even a greater degree than general facts and principles would lead us to infer. For, with the direct effect there come, also, indirect or collateral evils, which affect the soil, both as to its drainage and its pollution, which affect both air and water-supply, and which lead to the collection of filth in many ways. Yet where this is realized and compensations are made, it is astonishing how possible it is to overcome the disadvantages, and, in fact, turn them into real advantages. Indeed, this has been so efficiently done in some of the larger English cities as to show that collections of population can be run economically for health, just as the division and classification of labor in large factories or industries often makes the loss far less than it would in a more restricted occupation. Speaking, for instance, of the lowered death-rate of London, Mr. R. Rawlinson, C.E., says: "Since 1848 cesspools have been abolished by tens of thousands, so that London at this day stands sewered, drained, and freed from most of its cesspools, and is in this respect the most fully water-closeted and cleanest great city in the world." Where it becomes essential to classify work and to put it under expert administration, it is often far better done than if every one is left to do that which is right or wrong in his own sight.

But it must be fully and thoroughly realized that a house is an artificial thing, and that rows of houses filled with people are still more so, and that when we come to herd all classes of people in villages, towns and cities, we must recognize that we are placing them in unnatural conditions. Both nature and art must be so utilized and adjusted as to be compensatory, and then associated life becomes healthy as well as convenient. In accord with the general statement, we find that Bergen, Burlington, Cape May, Hunterdon, Morris, Somerset, Sussex and Warren counties have each a death-rate below fifteen deaths to every thousand inhabitants. These eight counties give an excellent showing for the year, although it should also be compared with that of the previous five years.

It has been claimed that the general death-rate of rural counties ought not to be higher than ten for the thousand in New Jersey. For counties with many towns and few cities of over five thousand popu-

lation, seventeen deaths to the thousand has been stated as an average rate. The counties of Cumberland, Gloucester, Monmouth, Ocean ard Salem, although quite rural in their population, come in between fifteen and seventeen death-rate for the thousand. Between seventeen and twenty-one we have Atlantic, Camden, Mercer, Middlesex and Union counties. Atlantic county would not fall in this division but for the large and sudden influx of summer population, and even with this has a larger proportionate number of deaths, because of the invalidity of many that are brought there. The other counties show the quick effect of city populations, especially those of the labor classes.

There are left the counties of Essex, Hudson and Passaic, with a death-rate of 22.17, 24.95 and 24.96, respectively. The death-rate of Hudson as a county is even higher than its death-rate as to its cities, because, in addition to great local disadvantages, these townships have thrust upon them many of the evils of the cities. They are made too much the dumping-places for all that is intolerable in the cities. In the case of North Bergen township, it should be included in the city death-rate, since it contains the almshouse, the penitentiary and the asylum of the county, and because of this has the highest township death-rate in the State. With the addition of cemeteries, odor factories, etc., it is not surprising that the whole county has so high a death-rate.

As we come to note the cities, these, too, differ among themselves as to death-rate, by reason of locality, of density and character of population, of trades and occupations, etc.

The lowest death-rates are those of Salem, 15.43; Plainfield, 16.25, and Rahway, 17.19. A reference to the birth-rates, however, will show that this low death-rate does not fully indicate the relative health of these places since they are defective in birth-rate and child population, and, so, have less of the material most susceptible to disease. Business depression, too, sometimes leads the younger and family classes to move away, while the middle-aged and the old, who have become fixtures, have to stay.

Next to these cities we find Phillipsburg, 18.10; Millville, 18.54; Bridgeton, 18.69; Burlington, 18.93. All these and other localities should be compared with the death-rates of the combined five previous years, as often, for a single year, the variations are from incidental causes.

Next are Bordentown, 19.68; Morristown, 20.77; Elizabeth, 20.93.

Between a death-rate of 21 and 24, other cities take their places in the following order: Trenton, Gloucester City, Orange, Harrison, Hoboken, Bayonne, Camden, Chambersburg, New Brunswick, Passaic and Town of Union.

Above a death-rate of 24 to the 1,000, we find in their order, Newark, Jersey City and Paterson.

We do not include Atlantic City for reasons already given, as, no doubt, but for its summer population its rate would be less by nearly one-half.

In most of our cities it is not yet time for sanitary measures to make themselves felt largely as to the general death-rate, although it should be manifest on some of the more preventable diseases. The cities of Camden, Newark and those of Hudson county, by reason either of Boards of defective powers, or their want of funds, have had no adequate sanitary care. Paterson has only within a year been placed on a basis of sanitary administration. Besides, with the increase of population, as to which our approaching census will inform us, the statement of death-rate for this year is, probably, calculated upon too small a population. It did not seem best to us to apply a table as to approximate population until we had the facts of the semi-decennial census. But, with the facts we have, there is much material for study. Also, it is only by getting the more general facts, and by their study, that we get that analysis which has always been found in the past a valuable guide in studying the health problems of society.

DEATHS UNDER FIVE YEARS IN COMPARISON WITH TOTAL DEATHS.

Of equal, if not greater, significance will be found a study of the comparative deaths under five years of age. These are very properly accepted as showing much as to the vigor of population and influences unfriendly to health. It is to be borne in mind that this column is not the death-rate for each 1,000, but a comparison between the total deaths and the deaths under five years of age. Such an exhibit of the percentage, which these deaths bear to the whole, show how many die at this early age and, also, how many more of such die in close cities and certain populations. It is a very unnatural thing for a child to die. It is only because we come to regard what is common as natural that such a mortality among the young does not at once, in the interests of social life and prosperity, compel a rigid

inquiry into causes. Anything approaching it among domestic animals would pass as a great national calamity.

When we find that over one-third of all deaths, at all ages, are from zymotic diseases or consumption, and that modern hygiene and medical art claim most of these diseases as preventable, we cannot but be led to close attention to causes in order that the material resource which we call population may not be wasted.

When we find that the deaths of children under five years of age in all Hudson county is 41.44 of the entire deaths, and between forty and fifty per cent. in many of the cities, we cannot but look upon young humanity as either the most perishable or the most mismanaged of all live material. As we look for the reason of the loss, it is not far to find.

Dr. George Wilson, in his book on "Healthy Life and Healthy Dwellings," has claimed that "the zymotic death-rate in healthy districts ought not to exceed 4 per 1,000," and Edwin Chadwick, C.E., "that in new localities with healthy dwellings, properly constructed drainage and a pure water-supply, we may reasonably look forward to insuring a death-rate of only 10 per 1,000."

Bad air and wrong feeding are the cause of very many deaths in the early ages. The counties can be profitably compared with each other, as well as the county and city deaths at these ages.

It is wise also to compare the death-rate of some cities with the immediate county in which they are situated. While, for instance, the death-rate of Jersey City, Hoboken, &c., varies but little from that of the county, the death-rate of Camden county, without Camden and Gloucester City, is 15.25; of Passaic county, without Paterson and Passaic, 10.53; of Essex county, without Newark and Orange, 13.63; of Mercer county, without Trenton and Chambersburg, 16.20; of Hudson county, without its cities, 31.90.

If the death-rate of a city is high in proportion to that of the surrounding county, it is all the more significant of manufactured diseases.

The year that we are considering must be regarded as a healthy year for the State. While measles had a wide-spread prevalence in the State, it did not register many deaths. While, as always occurs, some of the various communicable diseases have been epidemic in localities, it cannot be said of any one of them, save measles, that they have been very prevalent. While we have no accurate return of the number of cases of sickness, yet from some inquiry and from general

information we are led to believe that the greater knowledge of methods of isolation and prevention and of the hygienic conditions and surroundings which should be maintained during sickness has caused a decrease in the actual mortality—a smaller percentage of deaths, even where there is not much lessening of the number of cases. Indeed, one of the most hopeful signs in preventive as well as in remedial medicine is that practitioners have come to give to the former more of its relative significance—to include hygiene and prevention as a part of clinical and administrative medicine. We are able to-day to point to health officers and to many of our leading physicians as, in their own experience, in possession of facts which show the practical advantage of control over a large class of diseases by sanitary methods, for which they should receive the highest appreciation by the general public; all the more because their philanthropic and civic or patriotic service has no adequate pecuniary reward.

SPECIAL DISEASES.

In the study of special diseases and their prevalence in the State, physicians are respectfully asked to compare, from year to year, the tables and the synopsis of the diseases as presented in former reports. The tables are combined in the five-year table in the last report, the death-rates and other facts as to which will also be found in this report for purposes of study and comparison. The comments cannot be repeated, but are intended to be made so as, as far as possible, to give an outline of the facts and of the lessons which they convey. It is only by comparisons from year to year that we gain that advantage which in the history of disease is akin to clinical details of individual cases.

Remittent Fever. The average of deaths from this in the last five years, previous to the present year, was 344, showing for this year a lowering of the general average of 144. While there is no soil or telluric disease in which the number of deaths bears so small a proportion to the number who suffer, yet they are an indication of its severity and to no small degree of its prevalence. If there is any one fact established beyond controversy, it is that this disease is dependent upon what may be called artificial interferences with that natural process of decay by which the forces stored in vegetable nature are transferred into other modes of energy. Nature has its own way of con-

ducting the destructive as well as reproductive functions of the vegetable world, and has also many compensatory methods for the errors we make, or that circumstances make as to it. But there is a limit to these compensations. When the equilibrium is destroyed, or when changes and decompositions occur grossly out of the normal methods, the soil, the air, the water become the recipients of organic particles unfriendly to the best vigor of animal life. Those who are compelled to come into such localities, or to partake of the results of such changes, come to have a series of symptoms for which the more specific terms are remittent or intermittent fever. But as there are less declarative symptoms, the term malaria is used in a general way to describe them. While some of these are unmistakable, there are others which are very obscure. This has led to the use of the term malaria in a very loose way by the laity, and even by some physicians. Surely, a general condition of malaise is not to be called malaria unless we are able, technically, to identify the periodic and other concomitants or the type of disturbance, or unless the remedies which seem somewhat specific by their quick response give a kind of crucial test. While there is a difference of susceptibility on the part of individuals, and while there is such a thing as the establishment in some of a toleration of the influence known as acclimatization, we can not be too seriously impressed with the desirability of removing the influence as much as possible. This is done chiefly in three ways: By such drainage as will secure the free movement of air as well as of water through the upper ground; by not suddenly or permanently exposing to heat, ground with organic matter in process of decay without such drainage, tillage and heavy cropping as will dispose of the results by chemical and vital vegetative appropriation instead of diffusing it as irritant material for animal life, and by such use of preventive methods as will protect against the influence.

Of these, the first two are the most essential and radical. What drainage and tillage can do and has done is no longer one of the mysteries of art. If men will neglect this, and if, in addition, they will saturate the soil, impound the water, expose decaying material to moisture and sunshine so as to spread the organic materials through all the inbreathed air, they must not, while quaking with the chill or burning with the fever, or in general ill health because of this bad air called malaria, wonder at the mistake of Providence or the ignorance of doctors. It is only the evil genius of human methods

vigorously applied to the manufacture of disease. It was significantly emphasized a few years since, when a peculiar season and the sudden blighting of vegetation by a July sun precipitated an influence which so fell upon every citizen that not two persons in the community could be found who had not felt the effect, or could accept the challenge to come before the court and testify to their exemption. It led to such changes as greatly mitigated the evil, and, if followed out, will do much to relieve a troublesome stream at Bound Brook.

In the last report we alluded to two facts of more recent impression, viz., that water is more frequently a carrier of this organic or particulate matter into our systems than was formerly supposed, and, next, that heat, as now diffused by furnaces, etc., in houses and in cities, furnishes power of forced and unnatural decomposition to much vegetative matter in winter, and so makes this class of diseases more common in cold weather than formerly.

Typhoid Fever. No doubt is raised as to the relation of this disease to that class of filth which is most liable to accumulate in the household conditions of animal life. It can, perhaps, even more definitely, be called a fecal disease. It would seem that persons of susceptible condition, exposed to certain forms of matter undergoing degrading and unnatural changes, come to receive from it an influence which, in their systems, changes into a specific contagion, and so not only sickens them with a typical fever, but is able, through these secretions, to impart it to others. The only difference of belief is that some claim that no case of this especial type occurs without being transferred from some antecedent case, chiefly if not entirely through the intestinal secretions, while others believe that certain combinations and degradations may take place, such as originated the disease in the individual, or the materials therefor in his surroundings. Those that claim the latter do not deny that the more frequent transmission is by the former. But whichever view is correct, the fact remains of the relation of local and avoidable conditions to this disease. It is preventable, and at present is to be dealt with both with reference to not furnishing, by means of domestic filth, a nest or hatching-place, and so dealing with a patient and all his secretions and surroundings that he shall not be a propagating center. The average of deaths from this disease in the State for the last five years was 564, which was just the number of deaths from it the year previous to the last. This year we had from

it 640 deaths. Of this increase Hudson county had an advance of seventy over the average of five years, and Passaic county of eleven, while some counties are a little less. Essex and Camden show slight advances, and both are too high. In all of the cities of these large counties there cannot be too close attention to the water-supply. Since the close of the last vital year, Camden city shows an increase of typhoid fever.

While only one of the zymotic or filth-fermenting diseases, its index finger is never to be lost sight of by the local sanitarian. As it does not often occur in persons past fifty years of age, we ask of physicians a close statement of symptoms in the "remarks" where, in older age, the fever is plainly of this type. Of the 640 deaths, 431 were in cities of over 5,000. While this shows an excessive ratio in cities, it also shows that it largely prevails in towns, villages and rural localities.

Small-pox. This year, like the last, has shown very few deaths from this disease. It is the leading preventable disease, since, with the facilities of arm-to-arm and of bovine vaccination, there is no good reason why any case should ever occur in the State, unless it be in a person not susceptible to vaccination. Many old physicians will tell you that they have never found such a one. While we have good reason to believe that vaccination is much more common than formerly, it is to be remembered that the vaccination of the past does not protect the annual birth-crop. Parents must feel themselves charged with the duty of protecting their children in the first year of infantile life. Teachers and school trustees should insist upon it that all pupils be vaccinated. Both the State school and public health laws provide for this. Its importance and the facts in evidence are fully presented in former reports and in circulars of this Board.

Scarlet Fever. The deaths from scarlet fever this year have been two hundred and twenty-four less than the average for the last five years previous. It is still the dreaded disease of the household. Such signal instances come to us as to the prevention of its spread by isolation, by care and by the precautions of the attending physician, that we feel the mortality from it should be greatly diminished. In the hands of competent attendants, the first case is more likely to die than the rest, for the reason that it is not apt to be taken in hand so promptly, or to have as good hygienic conditions as the rest. As it is a

disease, so far as at present known, always derived from a previous case, too much precaution cannot be taken as to exposure thereto. We find in our records many cases of adult death therefrom. Because of the relation which the scarf-skin as well as the breath has thereto, it is more diffusable and longer transmissible than most of the contagions. Its transmission by means of milk purchased from families where the disease exists, is plainly proven. Cats or other small animals convey the disease. Physicians need care as to the return of children to schools, nor in case of death is it officious in them to advise as to the conduct of the funeral in the interests of health.

Measles numbered seventy-four deaths above the average of the last five years previous. Of the whole number of deaths (one hundred and eighty-nine), one hundred and fifty-three occurred in the counties of Essex, Hudson and Passaic; one hundred and thirty-six in the cities of Newark (forty-eight), Jersey City (forty-five) and Paterson (forty-three), and one hundred and fifty-two in all in cities. It is a disease, so far as we can judge from our tables, as frequent in the country as in cities, and one which no section fully escapes. But it is noticeable that it is much more fatal in cities than in the country, and chiefly so from the bad air and the complication of pulmonary disease which occur. In too many instances where it does not cause death it initiates an impairment of the breathing organs, and leads to bronchitis, consumption or other forms of lung lesion. The decrease of its occurrence and of mortality therefrom depends largely upon prevention, isolation and the best hygienic conditions.

Whooping-Cough. The same remarks apply measurably to this disease, which, although having a spasmodic element, is essentially a bronchial disease. It numbered in all 116 deaths, or seventy-five less than the average of the previous five years. It, too, has a special city fatality, seventy-two out of the 116 deaths having been in cities of over 5,000 inhabitants. Conditions of atmosphere and of exposure, as well as of foul air and imperfect care, have much to do with its fatality. The physician should early mark out a line of management, even where no continuous attendance is needed. Since we have come to know that the expulsive breath and the sputa, whether fresh or dried, bear close relations to the communication of the disease, it is not so often transmitted as formerly.

Croup and Diphtheria. The cases of death therefrom for the last year were in all 1,027, or 117 less than the five-year average. But even yet the record is much more than that of small-pox, scarlet fever, measles and whooping-cough combined. This is all the more significant, since many of the deaths from scarlet fever are noted as having secondary diphtheritic complications. Even allowing for those who would class the sudden cases of croup as distinct from diphtheria, it leaves a number of deaths from this disease that may well attract our most serious attention. In the fourth report, (1880, pp. 7–13,) we sought to outline the chief evidence as to the character of this disease. While long ago recognized as a sequel in measles, scarlet fever, and some other ailments, it is within about thirty years that it has come to have more distinct consideration. From the fact that, unlike the eruptive diseases, one attack does not serve to prevent another, it continues to be, even more than these, the dread of households. It has, in some respects, a history and a progress quite different from other communicable diseases.

A prominent medical authority has recently sought to emphasize the fact that its milder forms often occur unnoticed, or so mild as not to confine to the house, and that thus it arises from conveyance much oftener than is supposed. There are certainly forms of follicular or diphtheritic sore throat that either convey the disease or put the local mucous membrane in a condition susceptible to its implantation. But multitudes of cases are on record in which there seems to have been no reasonable explanation except that of *de novo* or spontaneous origin by certain co-operations of filth, dampness and heat. There is no disease to which the principles of isolation, of watchfulness, and of prompt treatment, need to be more sedulously applied. It is even probable that antecedent treatment limits or prevents the disease. Those physicians who are watchful of throat conditions, and who deal most promptly with the first symptoms, are the most successful after the first case which has often made too much progress before its gravity is suspected. It is rarely that there is not some local change in the appearance of the throat before there are any constitutional symptoms. Always where diphtheria is prevailing an examination of the throat is desirable, since the first symptoms are without pain or other marked manifestation. It is believed by most that the early use of remedies, both topically and internally, are very certain to abort the disease in its early stages. The confidence that our ablest practitioners have in

grappling with the disease, if only they can regulate homes and surroundings and see patients at the earliest moment, is the best evidence that the duration of its death-rate is within the reach of preventive and restorative sanitation.

Diarrheal Diseases. The deaths by diarrheal disease, as stated in the statistical column, include only deaths between one month and twenty years of age. Diarrheas of the first month are so often incidental that they should not enter the general classification, while those of older life are properly ranged with digestive and intestinal diseases. A large proportion of the deaths from diarrhea are under five years of age. The average of the five previous years was 2,353, while the number of this year was 2,462. Comparison between the rural and the city counties, and between these counties and their cities, are the strongest evidence of how far such deaths are the results of artificial causes. One thousand seven hundred and twelve of the deaths were in cities of over five thousand, although the population is nearly equally divided between these and the portion of the State not thus included. There is a similar excess of death-rate of children under one month in such cities. The excesses are most marked in Jersey City, Newark and Paterson. Ill care, improper food, bad air and bad water have this special way of telling their tale. So evident has this become, even to the eye of a general charity, that fresh air funds have been provided by a spontaneous gratuity. The death-rate is thus lowered by the better food and better air of the open country. Even the changes of a day are often found to record marked improvement.

The worry of mothers, impure milk, and with older children the promiscuous use of table food, has much to do with this increase. But the general conditions of city life, and the fact that the working and more dependent populations are not able to leave cities permanently for the summer months, makes this great mortality. If the death-rates from infantile diarrhea were reckoned on the basis of the actual summer population of our cities, it would be much larger. If the methods adopted by New York City, Boston and a few other cities in the care of the infant population for the summer months is correct, that of Jersey City, Newark and Paterson are very defective. It deserves to be noted that the Health Board and Health Inspector of Paterson so far recognized this that they have already devised methods of prevention. We earnestly urge on all local city Health Boards to

study their statistics in reference to ward and neighborhood conditions, and to seek that knowledge of tenement and other house conditions which is essential to the proper care of civic life.

Dysentery. This is not made a separate column in our printed tables, but is marked by a dot, so as to distinguish it on the office sheets. It has prevailed more this year than during any previous year since the facts have been systematically obtained. One hundred and eighty-eight cases in all are reported. It is especially noticed in Burlington, Essex, Gloucester, Hudson, Passaic and Warren counties. In the vicinity of Williamstown it was so prevalent as to lead to active inquiries and arrangements for prevention by the Board of Health. There were, however, few deaths in that county. Before this, the vicinity of Mount Holly has had more than its share of the disease. It is believed to be traceable to polluted wells, much more than is generally appreciated. Special conditions of heat and moisture and malarial influences have much to do with its prevalence. Physicians and others should carefully examine as to water-supply and other sanitary conditions where cases occur. Also as to its possible communicability to others through the discharges. The disinfection of the discharges and their disposal in ground distant from wells, rather than in the common privy, is always desirable when possible.

Erysipelas does not record a large death-rate. But because of its frequent occurrence, of its occasional malignant character and its relation to puerperal fever, it deserves the close attention of clinicians and vital statisticians. The deaths from it for the five years previous to this, were within eighteen of those from measles. It is no longer in doubt that it has a specific contagion, under some circumstances communicable, and so is to be dealt with as is this class of ailments. J. Burden Sanderson, in his Pathology of the Infective Processes, says of it that it "originated from a focus of infection." A contagion has been inserted or otherwise came into existence in the tissue of the affected part. The effect seems to be not that of general septic change, but dependent upon micrococci. Whether the disease is, therefore, an implanted one, or whether it has come about from some degraded condition of the blood or tissue, may not always be certain. But the possibility of others contracting it, of its conveyable character, of its becoming a malignant epidemic, and of its affect-

ing those who are in a puerperal or traumatic condition of susceptibility, is ever to be borne in mind.

Puerperal losses differ but little from the average of former years. These are so serious to families and so often leave children in dependent orphanage, that too much protection cannot be given to mothers from the avoidable perils of maternity. That erysipelas, scarlet fever and suppurating wounds are sometimes a danger at such periods, is admitted. That there is also peril from unskilled attendance, cannot be denied. It is doubtful whether those who have no diplomas in midwifery should be allowed to offer their services in this capacity. While every facility of choice, consistent with safety should be afforded, most governments, in their economy of human life, have thought proper to require some test of fitness. Others provide retreats for those who need attendance and have not property or home conveniences.

Consumption, which is so dependent in very many cases upon avoidable causes, for the last three years has the following statistics of deaths:

	Males.	Females.	Total.
1881–82	1,696	1,779	3,475
1882–83	1,527	1,594	3,121
1883–84	1,557	1,658	3,215
Total			9,811

Thus it causes about one-seventh of the whole number of deaths. But as few die of consumption under five years of age, and as its chief havoc is with grown life and during the productive and industrial period of life, it is more significant than the mere numbers would indicate. About twenty-three per cent. of all adult deaths are from this disease. The deaths therefrom this year have been a little beyond the average for the last five years. It will be noted that the number of deaths of females from it is uniformly a little beyond those of males, the excess for three years being 251.

Consumption stands for a large amount of preventable disease. While it comes by inheritance, it comes still oftener as a direct result of occupation, of unventilated houses, school-houses and work-shops, and of unwholesome food and of imperfect care in many ways. It also has much to do with dampness of soil and of houses, with sudden changes of temperature and with a sedentary life. Former reports

furnish some important details as to this disease. While the number of deaths recorded therefrom in the five years previous in the State is 15,077, the number in cities over 5,000 is 9,072. For the last year, of the whole number, 3,215, the number in cities of over 5,000 was 1,996. It is on the increase as a disease of city life, and is a warning index of the deterioration of population. It is also to be borne in mind that pneumonia and chronic bronchitis cause very many deaths and are also largely attributable to local conditions.

Acute Lung Diseases. The record of these for five years previous to this year was 11,864, of which 7,130 were in cities of over 5,000 inhabitants. For the last year the deaths therefrom were 2,174, of which 1,416 were in the cities. Pneumonia is so prevalent and fatal in some winters or parts of seasons as to have led some to regard it as at times having some specific cause. It certainly shows much more tendency at some times than at others to assume a typhoid character.

The agency of foul air in causing pneumonia is no longer doubted. When an audience rushes out from an ill-ventilated and crowded assembly room into the open air, it is not simply that there is a sudden change of temperature. The circulatory system of the lungs and the vaso-motor nerve supply of its tens of thousands of minute vessels is seriously affected and depressed by such infliction. The healthy and unembarrassed lung rapidly adjusts itself to changes of temperature, if not too intense. But if by bad air you paralyze the power of adjustment, the depression is increased, or if there is reaction it is in the direction of congestion. We would therefore emphasize the fact that acute lung diseases are not less dependent upon the depressing influences of befouled air than upon thermometrical and barometrical changes.

Brain and Nervous Diseases of Children. In the last five years previous, 8,609 children, or persons under twenty years of age, died of this class of diseases, of which 5,905 were deaths in cities of over 5,000 inhabitants. For the last year the number was 1,598, of which 1,110 were in the larger cities. While it is impossible to state how many of these are preventable, we do know that wrong food, the neglect of first symptoms, and the pressure of school life have much to do with the multiplication of such diseases. A recent circular of this Board, (XLVII.,) cautions parents as to early attention to first

symptoms. The number of deaths does not fully measure the extent, for many brain and nervous ailments in after life have their origin in neglect or mistakes during the growing age.

Diseases of Heart and Circulation. Five thousand five hundred and seventy-five was the number of deaths from this class for the five years previous to the last, of which 2,906 were in cities. For the last year there were 1,324 deaths from this cause in all, of which 746 were in cities. It will be noticed that the excess in cities over the country is not so large in proportion as from several other diseases. Rheumatism is a very potent factor in the causation of heart disease. It is as common in the country as in the cities, by reason of greater exposure. Many farmers have to trace heart disease to attacks of rheumatism which have gradually impaired the valves of the heart. In most cases of death returned as acute rheumatism, the immediate cause of death has been pericarditis or other interference with the heart and circulation. Hereafter, in the printed table, acute rheumatism will appear in the heart column, and be distinguished as usual on the office tables. The deaths from it for the five previous years were 318, of which 154 were in cities. This year it numbered 62 deaths, of which 28 were in cities.

Urinary Diseases. Distinction between urinary and kidney diseases are marked in our office records. The whole number of deaths for the five years previous was 3,199, of which 1,804 were in cities; for the last year 892, of which 558 were in cities. This marks some increase. There is some reason to believe that the freer use of condiments and of burning catsup, as well as alcohol, have a serious effect on the complicated circulation of the kidney. This is all the more serious since many cases of adult brain disease are secondary and dependent upon some form of renal inflammation or failure in function.

Adult Brain and Spinal Diseases. These for the five previous years have numbered 7,247 deaths, of which 3,447 were in cities. The last year numbers 1,664 deaths from this cause, of which 806 were in the larger cities. Paralysis and apoplexy are often diseases of very robust as well as of overtaxed life. The causes which give rise to this class of diseases are various. The energy of business, the active rush, the hurried methods of the age greatly tend to overcome deliberation and

add to the wear and tear of human life. Such diseases increase out of their due proportion, and many fall victims to long paralysis or to death sooner than would occur in the quiet walks of life. Caution and precaution, due self-control and skilled advice would postpone for many a too early breaking down of nerve and mental forces.

Digestive and Intestinal Disease. When it is remembered that this column includes no one under twenty years of age in our enumeration, the deaths of 4,789 in five years from these causes (2,455 being in cities), or of 1,075 the last year (607 being in cities), shows that large numbers succumb to errors in diet, such as are not sudden in their results. Very many formed and endowed for a life of seventy years, have their days shortened by errors which finally wear out the powers of digestion. Rules as to good food, exercise and the management and self-control of the appetite deserve to be carefully studied by all who would ward off the later failures of life-power. With such the power to secure and use up the right food after the middle period of life is the determining consideration as to whether the life can be prolonged to old age.

Cancer. For five years previous our returns record 2,115 deaths, of which 1,127 were in cities. For the past year there were 484 deaths, of which 288 were in the larger cities. It is a disease which as to its causes and pathology is having close study, but which as yet fails to be reached by preventive methods.

A review of these causes of death furnishes us with many indications as to preventable disease, and the proper care of population. When it is remembered that careful statistics based on life insurance and other facts as to disease, have shown that for every death there are on an average two persons sick the year round, or as Lyon Playfair calculates it, there are for every unnecessary death twenty-eight cases of unnecessary sickness, we cannot but come to some realization of what a tax on happiness, on industrial energy, and on all life, avoidable deaths and avoidable sickness are, and redouble our energies to restrain the wastes of avoidable disease, to remove its burdens, and so add to human health and happiness.

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